State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

April 7, 1999

Dave Shaver
Andalex Resources, Inc.
6750 Airport Road
P. O. Box 902
Price, Utah 84501

RE: Postmining Land Use Change and Partial Bond Release Proposal, NEICO, Wellington Preparation Plant, ACT/007/012, Folder #2, Carbon County, Utah

Dear Mr. Shaver:

The purpose of this letter is to inform you of the progress which the Division is making regarding review and approval of NEICO's application to 1) change the post mining land use for a portion of the Wellington Preparation Plant to an industrial post mine land use and 2) release the reclamation bond for that area.

The remaining technical issues in the division review deal with the manner that coal materials presently on site will be handled under the industrial post mining land use. Your recent assurances (by fax 4-5-99) to Ms. Grubaugh-Littig cover this topic and I quote from your letter:

"a. To the extent economically feasible we (Andalex) will utilize as much of the coal material as possible as pad material for the stock pile areas of the new (coal) loadout. We will pay AML fees on the recycled pad coal if DOGM determines this to be a regulatory requirement.

b. Much of the coal material will be used to construct the impoundment structure of the main sediment pond. We estimate that up to 7000 cubic yards of this material would be utilized for this purpose.

c. Any remaining coal material would be contained harmlessly within the hydrologic confines of the newly constructed sediment pond. This pond would be a permanent structure and would serve as the primary means of sediment control for the life of the new loadout facility. Coal material remaining within the interior of the pond would be graded to a smooth, even surface.

d. We also commit to dedicating a 6.3 acre area of topsoil material within the site (area J on map G9-3511) for the purpose of final reclamation of the refuse pile. This

commitment is made under the agreement with DOGM that this area would be released from the (Wellington Preparation Plant) permit when 13,019 cubic yards of topsoil has been salvaged from this area and relocated to the main topsoil storage pile area located south of the refuse pile."

Based then on Division review of the proposal and the above assurances from you, the Division is able to make findings for the alternative postmining land use change under R645-301-412 and 413 that "there is reasonable likelihood for achievement of the use". However, before we proceed with approving the postmining land use change and any change to the bond amount on the Wellington Preparation Plant permit, the Division will need an affidavit from Andalex. The affidavit must state that the terms and conditions enumerated in the September 25, 1998, Memorandum of Agreement between EarthCo, NEICO, and Andalex Resources are still in effect, and that Andalex intends to exercise the purchase option with the intent of constructing a coal loadout on the referenced property. If the Division can be "assured" that this alternative postmining land use will occur immediately upon bond release, then the post mining land use can be finally achieved and release of the bond can be made.

I hope that this letter serves to assure you that there is excellent progress toward approval of the proposal and that it also serves to inform you of the affidavit requirement. If you have any questions, please call me at 801-538-5370.

Sincerely,

Lowell

Lowell P. Braxton
Director

cc:
Patrick Collins, Mt. Nebo
Mary Ann Wright
Pamela Grubaugh-Littig
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Facsimile
(801) 237-1950

July 12, 1999

Denise Dragoo, Resident Agent
Horizon Mining, LLC
c/o Snell & Wilmer
111 East Broadway, Suite 900
Salt Lake City, Utah 84111

Re: July 12, 1999 Request for Extension to Comply with Division Order 99C (Order to Post Bond), Horizon Mining, LLC, Horizon Mine, ACT/007/020, File #3, Carbon County, Utah

Dear Ms. Dragoo:

We have received your request of July 12, 1999, wherein Horizon Mining, LLC requests an extension to the deadline for Division Order 99C in order to complete the sale and permit transfer to Lodestar Energy, Inc. Under DO 99C, Horizon is required to post a bond of $711,000 for the Horizon Mine. The extension is hereby granted and the new deadline is close of business, or 5:00 p.m., Thursday, July 15, 1999.

Sincerely,

Lowell P. Braxton
Director

tam
cc: Michael Malmquist, Parsons
PFO
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State of Utah

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July 22, 1999

Chuck Semborski, Environmental Supervisor
Energy West Mining Company
P.O. Box 310
Huntington, Utah 84528

Re: Approval of Phase I Bond Release at the Cottonwood Waste Rock Site, PacifiCorp, Cottonwood/Wilberg Mine, ACT/015/019-BR98, Folder #2, Emery County, Utah

Chuck

Dear Mr. Semborski:

Phase I bond release for the Cottonwood/Wilberg Waste Rock site (13.81 acres) is approved. This permitting action represents Phase I bond release, but no monies are released.

I have attached the OSM concurrence for this bond release. If you have any questions, please call me or Pamela Grubaugh-Littig.

Sincerely,

Lowell

Lowell P. Braxton
Director

tm
Attachment
cc: Jim Fulton, OSM, WRCC
O:\015019.CWW\BOND\APPLTRPH.WPD

IN REPLY REFER TO:

United States Department of the Interior

OFFICE OF SURFACE MINING
Reclamation and Enforcement
1999 Broadway, Suite 3320
Denver, Colorado 80202-5733

July 21, 1999

Mr. Lowell P. Braxton,
Division Director
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801

RE: Decision Document to Approve Phase I Bond Release at the Cottonwood/Wilberg Mine, Waste Rock Site

Dear Mr. Braxton:

This letter acknowledges the Office of Surface Mining's (OSM) receipt and review of the subject decision document prepared by the Utah Division of Oil, Gas and Mining (DOGM). The proposed bond release area at the waste rock site contains Federal lands. OSM is in agreement with the decision document and hereby provides OSM concurrence to release Phase I bond on 14 acres of the Cottonwood/Wilberg waste rock site in accordance with the Federal regulations at 30 CFR 740.15 (d) (3), and 30 CFR 944.30, Article IX, section B, of the Federal-State Federal lands cooperative agreement.

The decision document thoroughly describes the reclamation history of the waste rock site identifying significant inspection observations which occurred throughout reclamation of the site including backfilling, grading, and revegetation. Beginning in October, 1998, the decision document clearly describes the bond release process milestones DOGM implemented in accordance with Utah Rule R645-301-880 through 880.330. Engineering and hydrological analysis, topsoil replacement analysis, and inspection findings demonstrate compliance with the approved reclamation plan for the site.

DOGM conducted the required bond release inspection on May 13, 1999, and OSM's Denver Field Division (DFD) participated in the inspection. There were no problems noted during the inspection. The United States Department of the Interior, Bureau of Land Management, (BLM) was notified of the bond release inspection and elected not to attend. No public comments were received by DOGM through the advertized comment period. BLM provided DOGM written concurrence dated June 22, 1999, agreeing with the proposed Phase I bond release.

United States Department of the Interior

OFFICE OF SURFACE MINING
Reclamation and Enforcement
1999 Broadway, Suite 3320
Denver, Colorado 80202-5733

IN REPLY REFER TO:

The permittee, PacifiCorp, has met the requirements for Phase I bond release found at Utah Rule R645-301-800, and DOGM has processed the bond release application in accordance with the applicable Utah rules. OSM understands approximately 13.81 acres (14 acres) are eligible for Phase I bond release at the waste rock site. The surface rock storage area at the site is not included in the release area. OSM understands no release of bond monies has been requested or approved.

Thank you and your staff for coordinating this Federal lands bond release with the DFD. Please address any questions concerning this letter to Henry Austin, Reclamation Specialist, at **haustin@osmre.gov** or (303) 844-1400 x1466.

Sincerely,

James F Fulton

James F. Fulton, Chief
Denver Field Division

cc: Dennis Oakley, PacifiCorp
USDI/BLM/Utah

Michael O. Leavitt
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CHRON

August 13, 1999

TO: Whomever it May Concern

FROM: Lowell P. Braxton, Director, Division of Oil Gas and Mining

RE: **Clemment "Mickey" Bradley** of Bradley Safety Consultants, Wilburton, Oklahoma

This letter is to outline Utah's experience in using the services of Mr. Clemment Bradley as the instructor of the Utah Coal Regulatory Program - Surface Blaster Certification and Training Program. Mr. Bradley has been the contractor providing surface blaster training, examination, and certification to the Utah coal mine and minerals community since 1991. Above all else, Mr. Bradley provides an inherent margin of blaster safety in his deeds, teachings, and technical advice.

During the last 8 years when Mr. Bradley was a blaster training contractor for the State of Utah, he provided exemplary service as an instructor, technical advisor, and consultant. From our staff, course participants, and mineral/coal producing companies, we have received only praise and compliments on his style, teaching abilities and technical accuracy in the blasting field. In addition, in November of 1996 we called on the services of Mr. Bradley as a consultant in the Division's Abandoned Mine Reclamation Program when a magazine filled with unstable high explosives was found at an abandoned mine reclamation project. Under his guidance we were able to avert a serious explosives accident by placing him on the incident management team as a Division representative dealing with the problem.

Please let me or Mr. Ron Daniels (at 801-538-5316) know if there are any additional questions or if you need additional information.

dr
O: Ron\blaster.ltr.wpd

P. 01

TRANSACTION REPORT

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Michael O. Leavitt
Governor
Lowell P. Braxton
Division Director

UTAH DIVISION OF OIL, GAS AND MINING
FACSIMILE COVER SHEET

DATE: August 13, 1999

FAX#: 918-465-3405

ATTN:

COMPANY: Bradley Safety Consultants

DEPARTMENT:

NUMBER OF PAGES: (INCLUDING THIS ONE) 2

From: Lowell P. Braxton, Director, Division of Oil, Gas and Mining

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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Division Director

UTAH DIVISION OF OIL, GAS AND MINING
FACSIMILE COVER SHEET

DATE: August 13, 1999

FAX#: 918-465-3405

ATTN:

COMPANY: Bradley Safety Consultants

DEPARTMENT:

NUMBER OF PAGES: (INCLUDING THIS ONE) 2

From: Lowell P. Braxton, Director, Division of Oil, Gas and Mining

If you do not receive all of the pages, or if they are illegible, please call (801)538-5340.
We are sending from a sharp facsimile machine. Our telecopier number is (801)359-3940.

MESSAGES:

You will also be receiving a copy by mail.

Bradley Safety Consultants
RR 3, Box 770
Wilburton, OK 74578

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

State of Utah

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September 30, 1999

TO: Lowell P. Braxton, Director LPB

THRU: Mary Ann Wright, Associate Director, Mining MAW

FROM: Pamela Grubaugh-Littig, Permit Supervisor pgl

RE: Active Coal Bond Status Report as of September 30, 1999

Attached is a copy of the current active coal bond status report. Presently, the coal program has a total of $77,781,022 in various forms of reclamation bonds.

Corporate Sureties	(27)	$73,933,840	> 96%
Irrevocable Letters of Credit	(4)	$ 3,393,000	> 4%
		$ 77,326,840	

NOTE: Aetna Insurance Company merged with Travelers Insurance Company on July 1, 1997. The Division received $1,850,154 in 1997 for reclamation at the Sunnyside Mine from the U.S. Bankruptcy Court.

Three bonds were fully released during the second quarter of 1998: Knight Mine (April 21, 1998), Gordon Creek #3 & #6 Mine, and Huntington #4 Mine (both on May 22, 1998).

tm
Attachment
cc: Daron Haddock
Price Field Office
Public Information Center
O:\COALBOND.RPT\COALBND.NEW

COAL BONDS

As of September 30, 1999

NAME Of Project Permit Number	Disturbed Surface Acres	Present Bond Amount (Year Dollars)	Type of Bond Posted	Principal Holder* (Best's Rating) 1999	Year Date Posted (Ridered)	Cost per Acre	Comments
Lodestar Energy, Inc. White Oak Mine No. 1 & No. 2 ACT/007/001	140.2	$4,292,000 (1999)	Surety	Frontier Insurance Company (A++) #143715	07/09/99		Transferred from Valley Camp 5/27/94. (Disturbance in mine site, office & loadout.). JWC letter of 6/19/95 will reduce bond to $ 3,398,000 (1999 dollars). Replaced 7/27/98. Bond amount increased to 4,292,000 for permit renewal, due 8/24/99. Permit transferred from White Oak Mining and Construction on 7/14/99.
Castle Gate Holding Company Castle Gate Mine ACT/007/004	134.5	$1,804,000	Surety	National Fire Insurance Company Hartford #929-80-55 (A+)	01/31/86 (10/03/94) (02/06/96) (09/09/97) (08/26/98)	$13,413	Increased to $4,415,505 on 10/3/94; Reclamation Agreement Submitted 1/95. Ridered 2/6/96. Phase I Bond Release of $400,775 on 1/31/97. Ridered 9/9/97 from $6,757,451. Ridered to Castle Gate Holding Company, permit transferred on 9/13/98.
Canyon Fuel Co, LLC Skyline Mine ACT/007/005	65.38	$5,076,000 (2001)	Surety	Liberty Mutual Insurance Co. #14-000-068-0004-UT (A+)	06/01/98	$87,274	Original Bond Amount - $1,850,500 (6/20/89); Bonds replaced 7/30/90; Rider added 3/15/90; Rider added 6/9/92; Transferred from Costal Energy to Canyon Fuel Co. LLC on 12/20/96. $6,140,000 agreed on 6/23/97, to be posted by 7/28/97. Conference held. Bond re-adjusted to $5,076,000 (2001), and posted 10/23/97. Replaced surety 6/1/98, new parent ARCH Western Resources.
Plateau Mining Corp. Star Point Mine ACT/007/006	173.2	$10,581,000 (1999)	Surety	Travelers Casualty & Surety Insurance Co. 64S100208576BCA (A+)	11/26/85 (10/26/90) (04/27/94) (09/24/98)	$61,091	Reclamation Agreement Signed 11/2/90; Ridered "termination" language 9/91; Increased to $5,180,000 (1996) on 4/27/94. Increased to $10,581,000 on 9/24/98.

NAME Of Project Permit Number	Disturbed Surface Acres	Present Bond Amount (Year Dollars)	Type of Bond Posted	Principal Holder* (Best's Rating) 1999	Year Date Posted (Ridered)	Cost per Acre	Comments
Sunnyside Coal Company Sunnyside Mine ACT/007/007	287.4	$1,850,184 approved by U.S. Bankruptcy Court (Received)					Escrow Agreement Finalized 6/90 3/13/89 Active Status; Transferred from Kaiser Coal Co. to SCC (previously SRS) 5/26/89. C.D. issued for $75,000 at Zions First National Bank. First Deed of Trust for Undisturbed Land and Water Rights; Agreement 8/28/89 Filed Chapter 11 on 3/25/94; DOGM Filed Bankruptcy Claim 9/1/94; to Chapter 7 on 6/23/95. Undisturbed land sold to Penta Creeks on 3/12/96. OSM/DOGM agreed on $1,850,184 cash collateral on 11/18/96. Bond forfeiture on 11/22/96. Reclamation engineering awarded to Montgomery Watson in 7/97. All $1,850,184 received by 7/1/97. Bids awarded 5/19/98, contract signed 6/26/98. Work started 7/6/98. Completed 7/1/99.
Hiawatha Coal Company Hiawatha Mine Complex ACT/007/011	290	$2,838,000	Irrevocable Letter of Credit	Bank One, Arizona S 005519	12/12/97	$9,786	Permit transferred from U.S. Fuel Company to Hiawatha Coal Company on 12/12/97.
NEICO Wellington Prep. Plant ACT/007/012	356 (744)	$4,904,000 (1999)	Surety	Safeco Insurance Co. #5612986 (A+)	10/26/89 (05/27/93) (03/29/94) (09/09/94) (09/18/95) (03/02/98)	$13,775	Permit Transfer to Genwal 10/10/89; Permit Transfer to Castle Valley Resources 12/5/91; Rider added 5/27/93 Transferred to NEICO 4/18/94. Bond ridered 3/29/94 & 9/09/94 from $3,279,000. Ridered to $6,036,000 on 9/18/95. Ridered to $4,904,000 (Division approved bond amount change on 2/18/98.)
UtahAmerican Energy, Inc. Horse Canyon Mine ACT/007/013	50	$1,137,726 (1991)	Surety	Lincoln General Insurance Company (A-)	09/18/98	$22,754	IPA Acquired Horse Canyon Mine 4/5/90; Permit issued 5/6/91; Bond increased 5/3/91. Phase I Bond release on 2/5/97 in the amount of $812,276, and revised on 2/19/97. Permit transferred from IPA to UtahAmerican Energy, Inc. on 12/22/98. ILOC released 1/5/99.
Mountain Coal Co. Gordon Creek #2, 7 & 8 ACT/007/016	17.58	$641,443 (1989)	Surety	Liberty Mutual Insurance Co #14-000-068-0005-UT (A+)	06/01/98	$36,487	$45,000 was released. Ridered "termination" language 9/91. 1989 dollars. Mine closed 1990. Structures removed. Reclamation started 9/29/95, continued during 1996. Completed in fall 1997, but some work in spring 1998. Replaced surety on 6/1/98, new parent ARCH Western Resources, Inc.

NAME Of Project Permit Number	Disturbed Surface Acres	Present Bond Amount (Year Dollars)	Type of Bond Posted	Principal Holder* (Best's Rating) 1999	Year Date Posted (Ridered)	Cost per Acre	Comments
Mountain Coal Co. Gordon Creek #3 & #6 ACT/007/017							Original Bond Amount $346,000. 1986 dollars; Phase I-Bond Release Effective 6/26/87 Ridered 7/13/87. Phase II Bond Release (rider eff as of 2/13/95) $85,429. Phase III bond release approved 5/22/98. (Release of $52,971.)
Canyon Fuel Co. LLC Soldier Canyon Mine ACT/007/018	24	$3,238,000 (1999)	Surety	Liberty Mutual Insurance Co. #14-000-068-0002-UT (A+)	06/01/98	$134,917	Increased from $577,000 5/2/91; Increased in conjunction with renewal, includes waste rock, not built yet. Transferred to Coastal 9/15/93. Previously $1,940,000, 1991 dollars. (Bond posted 12/3/93) . $30,000 posted on 03/13/95 for Dugout Creek exploration. Transferred from Soldier Creek Coal Co. to Canyon Fuel Co, LLC on 12/20/96. Surety replaced 6/1/98, new parent ARCH Western Resources, Inc. Temporary cessation effective on 3/25/99.
Andalex Resources Centennial Project ACT/007/019	35.7	$381,839 $699,000 (1995)	Surety Surety	Utica Mutual Insurance SU34593 & SU1354086 (A)	5/16/83 7/3/90 (2/23/93)	$30,276	Ridered to increase to $1,080,839 on 7/3/90.
Lodestar Energy, Inc. Horizon Mine ACT/007/020	9.5	$711,000 (2001)	Surety	Frontier Insurance Company 125427 (A-)	07/09/99		Permit issued 10/10/96. Permit transfer pending to K&K Holding Company. Permit transferred 7/11/97. (Bond #400JU4131 replaced. St. Paul Fire & Maine replaced 7/11/97. Ridered to change to Horizon Mining, LLC on 10/30/97. Replaced 7/27/98. Midterm commenced 3/11/99, ordered to increase bond to $711,000 by 7/12/99. Permit transferred on 7/14/99 from Horizon Mining, LLC to Lodestar Energy, Inc.
North American Equities Blazon #1 Mine ACT/007/021	4.65	($38,000) (Forfeited 1991)			5/5/89	$25,333	Board ordered Phase I Bond Release on 2/28/91. LOC with First Interstate Bank replaced 2/91, (#S43865); Amount reduced from $48,400 4/30/91; Bond forfeited 5/24/91-Cashier's Check to Division; To AML on 2/9/94 per LPB.
Savage Industries, Inc. Savage Coal Terminal ACT/007/022	160	$2,525,000 (2001)	Surety	National Fire Insurance Company of Hartford (A)	12/09/97	$15,781	Ridered "termination" language 9/91. Permit reissued 5/2/94; Bond Ridered on 9/22/94. Savage & Mtn. Coal Co., co-principals. Revised to $2,525,000 (2001 dollars) on 9/18/97. Replaced Savage bond on 12/09/97.

NAME Of Project Permit Number	Disturbed Surface Acres	Present Bond Amount (Year Dollars)	Type of Bond Posted	Principal Holder* (Best's Rating) 1999	Year Date Posted (Ridered)	Cost per Acre	Comments
Andalex Resources, Inc. Wildcat Loadout Facility ACT/007/033	60	$813,795 (1999)	Surety	Continental Casualty Co. 400776222 (A)	12/1/92 (6/10/93)	$13,563	Changed from Pittsburgh National Bank in 4/92; Replaced ILOC 12/9/92. By letter dated 9/5/97, can reduce bond to $698,000 in 2000 year dollars.
Canyon Fuel Co, LLC Banning Siding Loadout ACT/007/034	21.4	$350,000 (2000)	Surety	Liberty Mutual Ins. Co. #14-000-068-0003-UT (A+)	9/15/93	$16,355	Transfer to Coastal States 9/15/93. Increased from $211,000 to $350,000 on 12/12/95. Transferred from Soldier Creek Coal Co. to Canyon Fuel Co. LLC on 12/20/96. Surety replaced 6/1/98, ARCH Western Resources, Inc.
Sunnyside Cogeneration Associates Sunnyside Refuse & Slurry ACT/007/035	202	$1,900,000 (1997)	Surety	Frontier Ins. Co. 35790 (A-)	4/21/94 (12/04/96)	$9,406	Permit Issued 2/4/93; ILOC (S-09742-00018) Replaced with Surety on 4/21/94. Continuation certificate 3/30/96 - 3/30/97 for bond #35790. Bond amount increased to $2,094,000. Per Division Order required by 10/22/96 but not posted to date. Ridered to $1,900,000 on 12/04/96.
Cyprus Plateau Mining Corp. Blackhawk Exploration Site CEP/007/038	3.1	$55,000 (Released)	Surety	Travelers Insurance Co. 64S100767004BCA (A)	9/21/92	$17,742	Exploration project ridered more disturbance. Permit terminated 5/17/96. Aetna merged with Travelers on 07/01/97. Released on 12/3/98.
Cyprus Plateau Mining Corp. Willow Creek Mine ACT/007/038	132.9	$11,949,205 (2001)	Surety	United Pacific Insurance Company U-2644-518 (A-)	04/19/96	$89,911	Permit issued 4/23/96
West Ridge Resources, Inc. West Ridge Mine ACT/007/041	20	$2,117,000	Surety	National Union Fire Insurance Co. of Pittsburgh, PA (A+)	3/19/99		Permit issued 4/1/99. Mining plan approval 6/30/99.
Canyon Fuel Co., LLC Dugout Canyon Mine ACT/007/039	10 2.3	$3,682,000 (2003) $30,000 (Exploration) #14-000-068-0008-UT	Surety	Liberty Mutual Ins. Company 14-000-068-0009-UT (A+)	03/13/98 (10/13/98)	$36,820	Original exploration bond posted 12/95 by St. Paul Fire & Marine Insurance Company. (Bond #JP1277). Permit issued 3/16/98. Surety replaced 6/1/98, ARCH Western Resources, Inc. Increased to $3,682,000 on 10/13/98 for Phase II.
Western States Minerals J.B. King Mine ACT/015/002	28	$126,078 (1986)	Surety	Seaboard Surety Co. #104570 (A+)	04/28/86	$4,503	Original Bond Amount-$262,577. Phase I Bond Release (effective 5/20/86) Ridered-4/28/86

NAME Of Project Permit Number	Disturbed Surface Acres	Present Bond Amount (Year Dollars)	Type of Bond Posted	Principal Holder* (Best's Rating) 1999	Year Date Posted (Ridered)	Cost per Acre	Comments
Mountain Coal Co. Huntington #4 Mine ACT/015/004							Original Bond Amount-$360,102; (Phase I-60% bond release effective-11/10/86 ridered-(12/31/86). Ridered "termination" language 9/91. Phase II Bond release effective when sed pond removed 3/20/95. Removed. Ridered 1/31/96. Phase III Bond Release pending removal of perimeter markers. Approved 5/22/98. (Released $46,734.)
Consolidation Coal Co. Hidden Valley Mine ACT/015/007	6.7	$95,501 (2001)	Surety	Seaboard Surety #331474 (A+)	10/13/95 (1/8/97)	$14,254	Original Bond Amount-$171,515. Phase I Bond Release effective 7/17/88. Permit transferred 11/2/95 from Hidden Valley Coal Company to Consolidation Coal Company. Ridered to $95,501 on 1/8/97.
PacifiCorp Trail Mountain Mine ACT/015/009	24.78	$1,000,000 (1999)	Surety	St. Paul Fire & Marine Ins. Co. #400JV3710 (A+)	9/01/94	$40,355	Federal Mine Approval Tract 1 & 2 Transfer effective 11/23/87; Federal Lease Tract approved 5/15/91; Ridered "termination" language 9/91; Ridered increased amount and disturbance on 4/28/92 (from $463,711 and 8.8 acres). Transferred from Mountain Coal Company to PacifiCorp 11/13/92. Ridered 8/3/93 to increase amount due to increased disturbance; Replaced 9/01/94. ($834,228 - year 1999 dollars.)
Consolidation Coal Co. Emery Deep Mine ACT/015/015	247	$3,454,443	Surety	Seaboard Surety #188617 (A+)	12/11/85 (5/3/91)	$13,986	Bond includes mine and preparation plant area.
PacifiCorp Des-Bee-Dove Mine ACT/015/017	74.5	$1,837,712 (2000)	Surety	St. Paul Fire & Marine Ins. Co. #400JN6139 (A+)	1/25/85 (12/6/90)	$24,667	New Bond Submitted for PacifiCorp 12/90; Ridered "termination" language 9/91; Replaced 9/1/94. ($1,553,638 - year 2000 dollars.)
PacifiCorp Deer Creek Mine ACT/015/018	95.79	$2,500,000 (2000)	Surety	St. Paul Fire & Marine Ins. Co. #400JN6140 (A+)	3/15/85 (9/17/92) (8/26/96)	$26,099	Waste Rock Storage Added 9/88; Original Bond Amount - $1,224,000; New Bond Submitted for PacifiCorp 12/90; Ridered "termination" language 9/91; Increased from $1,724,000 to include amendment changes 9/92; Disturbed Acreage increased to 93.29 acres (2/14/93); Replaced 9/1/94. Ridered for escalation 8/26/96.

NAME Of Project Permit Number	Disturbed Surface Acres	Present Bond Amount (Year Dollars)	Type of Bond Posted	Principal Holder* (Best's Rating) 1999	Year Date Posted (Ridered)	Cost per Acre	Comments
PacifiCorp Cottonwood/Wilberg Mine ACT/015/019	101.74	$2,071,098 (1994)	Surety	St. Paul Fire & Marine Ins. Co. #400JN6138 (A+)	6/15/84 (11/3/89) (6/7/90) (11/13/90)	$20,357	Original Bond Amount-$1,294,522 Ridered 6/7/90 for Waste Rock Site - $1,586,008 (New Bond Submitted 11/20/90 for PacifiCorp with revised amount); Ridered "termination" language 9/91; Replaced 9/1/94.
Co-Op Mining Co. Trail Canyon Mine ACT/015/021	10	$30,000 (1994)	Irrevocable Letter of Credit	Bank One Utah S005027	6/15/89 (4/24/96)	$3,000	Automatically Renewable; Phase I Bond Release - approved 7/18/94 for $120,000. Phase II release approved 1/31/96; ridered 4/24/96.
Co-Op Mining Co. Bear Canyon Mine ACT/015/025	24	$899,000 (1999)	Irrevocable Letter of Credit	Bank One Utah #1055	Ridered 3/1/99 (for C.W. Mining)	$37,458	Automatically Renewable; Increased to $340,282 on 1/11/94; Increased to $487,911 on 9/1/94; Rider increased to $507,000 on 2/17/95. Rider increased to $525,000 on 7/31/95. Bond increased to $899,000 on 3/1/99.
Genwal Resources Inc. Crandall Canyon Mine ACT/015/032	9.7	$1,654,000 (1999)	Surety	American Home Assurance Co. 14-96-15 (A++)	3/14/95 (6/14/97)	$170,515	Replaced ILOC 7/30/90 with Surety. Rider 9/21/93. Transferred to Genwal Resources Inc., on 3/22/95. SAFECO bond #4689174 replaced eff. 3/14/95. Ridered for culvert extension 06/27/97.
Canyon Fuel Company, LLC SUFCO Mine ACT/041/002	69.70	$3,988,000 (1997)	Surety	Liberty Mutual Insurance Company 14-000-068-0001-UT (A+)	04/12/91 (07/23/92) (07/27/95) (6/11/98)	$57,217	Ridered 7/23/92; Reclamation Agreement updated 2/25/93. Ridered eff. 7/27/95. Transferred from SUFCO to Canyon Fuel Company, LLC on 12/20/96. Bond amount found adequate on 6/12/97. Surety replaced 6/1/98, new parent, ARCH Western Resources, Inc.
BHP Petroleum (Americas) Knight Mine ACT/041/005							Federal Insurance Company Surety replaced 9/16/90. Phase I Bond Release on 11/08/94 of $480,000. Replaced with ILOC on 1/30/96. Final Bond Release on 4/21/98. (Released $320,000.)
Summit Minerals Summit #1 Mine (aka: Blackhawk Mine) INA/043/001	19	($120,300)	Subord. Agreement	Division (Real Estate In Wallsburg, UT) (Permit Denied)	Forfeiture 1/26/89		Not active coal mine, exploration only. (Bond Forfeiture); AML Reclamation complete 11/20/97. Real estate sold on 2/12/99 for $95,000.

NAME Of Project Permit Number	Disturbed Surface Acres	Present Bond Amount (Year Dollars)	Type of Bond Posted	Principal Holder* (Best's Rating) 1999	Year Date Posted (Ridered)	Cost per Acre	Comments
Summit Coal Company Boyer Mine ACT/043/008	7	($100,900)	Subord. Agreement	Division (Real Estate in Park City, UT) Permit Revoked 08/04/89	Forfeiture 6/3/89	$14,414	Collateral Bond has been sold and money in possession of State-AML. Started Reclamation in November 1994. Completed in March 1995. Field evaluation by Title V- draft of evaluation and cost accounting of bond forfeiture to Lowell Braxton on 10/20/95. Forfeiture on 6/23/89, completed on 4/17/97.

*All of the bonding companies are listed in the Federal Register, July 1, 1999, the Department of Treasury listing of Surety Companies acceptable on Federal Bonds.

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

September 30, 1999

TO: Lowell P. Braxton, Director

THRU: Mary Ann Wright, Associate Director, Mining

FROM: Pamela Grubaugh-Littig, Permit Supervisor

RE: Status of Liability Insurance for Coal Regulatory Program

The updated liability insurance status report for the Utah Coal Regulatory Program is enclosed.

tam
Enclosure
cc: Daron Haddock
Price Field Office
PIC
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LIABILITY INSURANCE FOR COAL MINES

As of September 30, 1999

Name of Project	Policy Number	Primary Insurance Company (Best's Rating) 1999	Effective Dates	"Accord Form"	XCU (Explosives)	Claims Made or Per Occurrence (Retroactive Date)
Lodestar Energy, Inc. White Oak #1 & #2 ACT/007/001	NGB0158323	Reliance National Indemnity Company	08/31/99- 08/31/00	Yes	Yes	Occurrence
AMAX Coal Company Castle Gate Mine ACT/007/004	6122944	Old Republic Insurance Company (A+)	06/30/99- 06/30/0	No	Yes	Occurrence
Canyon Fuel Co, LLC Skyline Mine ACT/007/005	GL01200289	St. Paul Fire & Marine Insurance Co. (A)	07/31/99- 07/31/00	Yes	Yes	Occurrence
Plateau Mining Corporation Star Point ACT/007/006	6122944	Old Republic Insurance Company (A+)	06/30/99- 06/30/00	Yes	Yes	Occurrence
Hiawatha Coal Company Hiawatha Complex ACT/007/011	BLW52313315	West American Insurance Company (A+)	01/22/98- 01/22/00	Yes	Yes	Occurrence
Nevada Electric Investment Company Wellington Prep. (EARTHCO Policy) ACT/007/012	WR-003164-1	Clarendon America Insurance Company (A)	11/01/98- 11/01/99	Yes	Yes	Occurrence
UtahAmerican Energy, Inc. Horse Canyon ACT/007/013	37104410	Federal Insurance Co. (A++)	06/01/99- 06/01/00	Yes	Yes	Occurrence
Mountain Coal Company Gordon Creek #2, #7 & #8 ACT/007/016	GL01200289	St. Paul Fire & Marine Insurance Company (A)	07/31/99- 07/31/00	Yes	Yes	Occurrence ($500,000 per location)
Canyon Fuel Co, LLC Soldier Canyon ACT/007/018	GL01200289	St. Paul Fire & Marine Insurance Company (A)	07/31/99- 07/31/00	Yes	Yes	Occurrence ($500,000 aggregate per location)

LIABILITY INSURANCE FOR COAL MINES

As of September 30, 1999

Name of Project	Policy Number	Primary Insurance Company (Best's Rating) 1999	Effective Dates	"Accord Form"	XCU (Explosives)	Claims Made or Per Occurrence (Retroactive Date)
Andalex Resources, Inc. Centennial Mine ACT/007/019	3710-25-94	Federal Insurance Company (A+ +)	07/01/97- 07/01/00	Yes	Yes	Occurrence
Lodestar Energy, Inc. Horizon Mine ACT/007/020	NGB0158323	Reliance National Indemnity Company	08/31/99- 08/31/00	Yes	Yes	Occurrence
Savage Industries, Inc. Savage Coal Terminal ACT/007/022	GL196003711	Continental Casualty Company (A)	04/02/99- 04/02/02	Yes	Yes	Occurrence
Andalex Resources, Inc Wildcat Loadout ACT/007/033	3710-25-94	Federal Insurance Company (A+ +)	07/01/97- 07/01/00	Yes	Yes	Occurrence
Canyon Fuel Co, LLC Banning Loadout ACT/007/034	GL01200289	St. Paul's Fire & Marine Insurance Company (A+)	07/31/99- 07/31/00	Yes	Yes	Occurrence ($500,000 aggregate per location)
Sunnyside Cogeneration Associates Sunnyside Refuse & Slurry ACT/007/035	083900014627	Wausau Insurance Company (A+)	03/25/99- 03/25/00	Yes	Yes	Occurrence
Plateau Mining Corporation Willow Creek Mine ACT/007/038	6122944	Old Republic Insurance Company (A+)	06/30/99- 06/30/00	No	Yes	Occurrence
Canyon Fuel Company, LLC Dugout Canyon Mine ACT/007/039	GL01200289 (Same for exploration)	St. Paul Fire & Marine Insurance Company	07/31/99- 07/31/00	Yes	Yes	Occurrence ($500,000 aggregate per location)
West Ridge Resources, Inc West Ridge Mine ACT/007/041	37102594	Federal Insurance Company (A+ +)	07/01/97- 07/01/00	Yes	Yes	Occurrence

Name of Project	Policy Number	Primary Insurance Company (Best's Rating) 1999	Effective Dates	"Accord Form"	XCU (Explosives)	Claims Made or Per Occurrence (Retroactive Date)
Western States Minerals J. B. King ACT/015/002	37107914 ERG	Federal Insurance Company (A + +)	04/01/99- 04/01/00	Yes	No	Occurrence
Consolidation Coal Company Hidden Valley Mine ACT/015/007	5AA045298-00	Lumbermen's Mutual Casualty Company (A)	11/05/98- 11/05/99	Yes	Yes	Occurrence
PacifiCorp Trail Mountain Mine ACT/015/009	X0296A1A99	Associated Electric and Gas Insurance Services Limited	02/24/99- 02/24/00	Yes	Yes	Occurrence
Consolidation Coal Company Emery Mine ACT/015/015	5AA045298-00	Lumbermens Mutual Casualty Company (A)	11/05/98- 11/05/99	Yes	Yes	Occurrence
PacifiCorp Des-Bee-Dove Mine ACT/015/017	X0296A1A99	Associated Electric and Gas Insurance Service Limited	02/24/99- 02/24/00	Yes	Yes	Occurrence
PacifiCorp Deer Creek Mine ACT/015/018	X0296A1A99	Associated Electric and Gas Insurance Services Limited	02/24/99- 02/24/00	Yes	Yes	Occurrence
PacifiCorp Cottonwood/Wilberg Mine ACT/015/019	X0296A1A99	Associated Electric and Gas Insurance Services Limited	02/24/99- 02/24/00	Yes	Yes	Claims Made (12/24/86)
Co-Op Mining Company Trail Canyon Mine INA/015/021	3710-74-68-ERG	Federal Insurance Company (A + +)	01/01/99- 01/01/00	Yes	Yes	Occurrence
Co-Op Mining Company Bear Canyon Mine ACT/015/025	3710-74-68-ERG	Federal Insurance Company (A + +)	01/01/99- 01/01/00	Yes	Yes	Occurrence
Genwal Resources, Inc. Crandall Canyon Mine ACT/015/032	X0229A1A98	Associated Electric and Gas Insurance Services, Ltd.	07/31/98- 07/31/99	Yes	Yes	Occurrence

LIABILITY INSURANCE FOR COAL MINES

As of September 30, 1999

Name of Project	Policy Number	Primary Insurance Company (Best's Rating) 1999	Effective Dates	"Accord Form"	XCU (Explosives)	Claims Made or Per Occurrence (Retroactive Date)
Canyon Fuel Co, LLC Convulsion Canyon Mine ACT/041/002	GL01200289	St. Paul Fire & Marine Insurance Company	07/31/99- 07/31/00	Yes	Yes	Occurrence ($500,000 aggregate per location)

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Distribution Category UC-950

U.S. Coal Reserves: 1997 Update

February 1999

Energy Information Administration
Office of Coal, Nuclear, Electric and Alternate Fuels
Office of Integrated Analysis and Forecasting
U.S. Department of Energy
Washington, DC 20585

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Questions and comments regarding the preparation and content of the report and specific questions on coal resources, demonstrated reserve base, estimated recoverable reserves, and coal classification should be directed to:

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Internet Access

The databases in this report can be accessed and downloaded via the EIA home page:

- http://www.eia.doe.gov.
- Click on "Coal"
- Databases and Files Menu — locate "Coal Reserves Data Base for 1997"

Preface

Section 205(a)(2) of the Department of Energy Organization Act of 1977 (Public Law 95-91) requires the Administrator of the Energy Information Administration (EIA) to carry out a central, comprehensive, and unified energy data information program to collect, evaluate, assemble, analyze, and disseminate data and information relevant to energy resources, reserves, production, demand, technology, and related economic and statistical information.

This report, *U.S. Coal Reserves: 1997 Update*, is the fourth in series of "U.S. Coal Reserves" reports. It presents State-level estimates of domestic coal reserves, which may be used in the analysis and forecasting of future coal supply. This report briefly describes the data, methods, and assumptions used to develop such estimates and explains terminology related to recent data programs. In addition, it provides documentation for revisions and adjustments since the previous report to the demonstrated reserve base (DRB) of coal in the United States and for coal quality and reserve allocations. The resulting data are supplied for general use by the public.

The January 1995 database on recoverable coal reserves located *at active mines*, which was included in the previous report, is not part of this update. Reserves at active mines are still reported in EIA's *Coal Industry Annual* series, but not the estimated distribution of rank and sulfur content in those reserves. EIA no longer maintains the coal supply analysis model that used and refined those data to evaluate the areas and magnitude of anticipated investment in new mining capacity.

The legislation that created EIA vested the organization with an element of statutory independence. EIA's responsibilities are to provide timely, high-quality information and to perform objective, credible analyses in support of deliberations by both public and private decisionmakers. EIA does not take positions on policy questions. Accordingly, this report does not purport to represent the policy positions of the U.S. Department of Energy or of the Executive Branch.

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Highlights

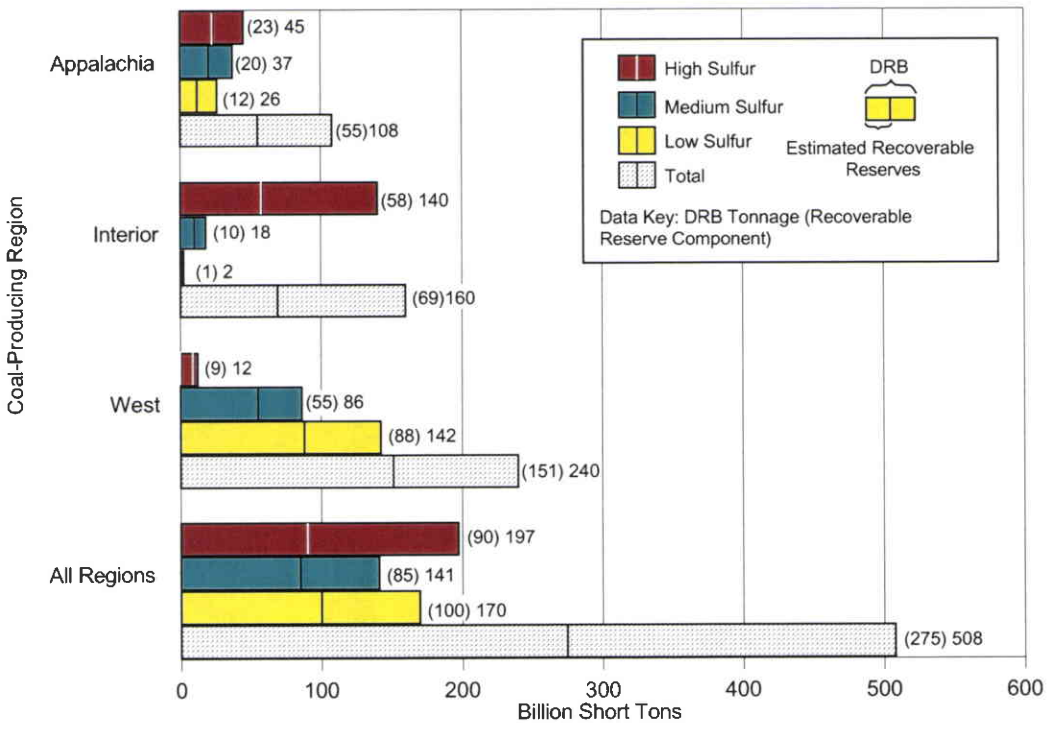
Demonstrated Reserve Base

This report, *U.S. Coal Reserves: 1997 Update*, contains updates to the coal resource and reserve data maintained by the Energy Information Administration (EIA). The demonstrated reserve base (DRB) of coal, first published in 1974, is an internally compatible subset of U.S. coal resource data which comprise the documented, in-place coal resources where, based on coalbed thickness and depth, mining is more likely to occur. Key DRB data include the following:

- ✔ **The new national estimate of DRB coal resources remaining as of January 1, 1997, is 508 billion short tons** (Figure HL1). Expressed in rounded numbers, this is an increase of 12 billion short tons from the previous (1995) DRB estimate of 496 billion short tons. Although the DRB is more than 466 times U.S. coal production in 1997, all the coal in the DRB cannot be recovered. Almost half the DRB is either inaccessible or likely to be lost in the mining process.

- ✔ The increase in the DRB is attributable to major revisions in a single State: Illinois. The DRB for Illinois increased by more than 15 billion short tons, based on resource data not previously mapped and analyzed for use in the DRB. This is

Figure HL1. Demonstrated Reserve Base of Coal and Estimated Recoverable Reserves in the United States by Sulfur Content and Coal-Producing Region as of January 1, 1997



Note: In each bar the entire length represents the demonstrated reserve base (DRB), and the segment of the bar on the left represents estimated recoverable reserves.

Source: Energy Information Administration estimates.

in addition to 12 billion short tons of coal resources added to the 1995 Illinois DRB 2 years ago, in the first phase of revisions.

- ✔ The 15 billion short ton increase in the DRB between 1995 and 1997 was partly offset by more than 3 billion short tons of depletion nationwide during the same period.

- ✔ **Nearly half the DRB is found in the West** (see Figure HL2). Coal resources recoverable by surface mining make up almost one-third of the DRB, more than half of which (58 percent) occurs in the West. Two-thirds of the DRB is minable only by underground mining, and more than half of that amount (58 percent) is found in the Interior and Appalachian Coal-Producing Regions. Overall, recovery of about 54 percent of the coal in the DRB is projected for surface and underground mining combined.

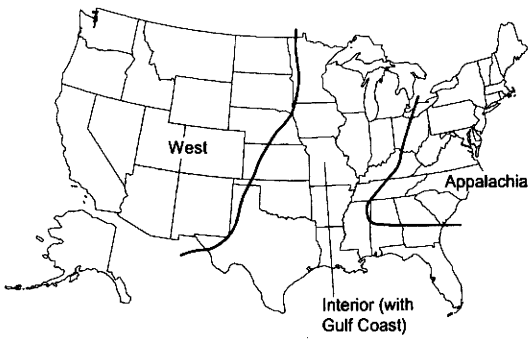
- ✔ **The quantities of low-sulfur, medium-sulfur, and high-sulfur coals in the DRB are relatively equivalent** (Figure HL1). Nationwide, low-sulfur coal is estimated to amount to 170 billion short tons, or 33 percent of all coal included in the DRB. Medium-sulfur coal accounts for 28 percent of the DRB and high-sulfur coal for 39 percent.

- ✔ **Most low-sulfur coal (84 percent) and medium-sulfur coal (61 percent) in the DRB is found in the West**. Most of the high-sulfur coal in the DRB (71 percent) is in the Interior region.

Estimated Recoverable Reserves

EIA's estimated recoverable reserves of coal equate to the calculated amount of coal believed to be recoverable from the DRB is in the United States. Estimated recoverable reserves are the quantities of DRB coal that may be recoverable, based on regional estimates of coal resource accessibility and mining recovery rates. Estimated recoverable reserves, which usually are assigned the same Btu and sulfur content as the DRB from which they were extracted, have the following characteristics:

Figure HL2. Coal-Producing Regions



Note: Delineations depict only boundaries between regions. Actual coal production originates from coal-bearing areas (not shown) within each region. For more information, see Table 13.
Source: Energy Information Administration.

- ✔ **The estimated recoverable reserves of coal in the United States include 275 billion short tons** (Figure HL1). Their distribution by low-, medium-, and high-sulfur levels may differ somewhat from the profile of their DRB source data because of regional differences in resource accessibility, geology, and recovery rates.

- ✔ **Estimated low-sulfur recoverable reserves make up the largest part of the total, at 36 percent.** Estimated medium- and high-sulfur recoverable reserves account for 31 and 33 percent, respectively. This distribution by sulfur content is somewhat transposed from that for the DRB, where high-sulfur coal accounts for the largest part of the total (39 percent).

- ✔ **Higher recovery rates are projected for the low-sulfur surface-minable reserves concentrated in the West than for the underground reserves in the Interior and Appalachia, where more of the coal must be mined underground and cleaned.**

1. EIA Coal Reserves Data

This report is the fourth in a series published by the Energy Information Administration (EIA) to provide data on coal resources and reserves (see "Important Terminology" box) allocated by estimated ranges of heat and sulfur content. EIA's estimated recoverable reserves are derived from the demonstrated reserve base (DRB) of coal in the United States (see DRB discussion in next section) by applying adjustments for the percentages of the DRB expected to be accessible, and then for the percentages of the accessible DRB expected to be recoverable by surface and underground mining. The usual understanding of the term "reserves" as referring to quantities that can be recovered at a sustainable profit cannot technically be extended to EIA's estimated recoverable reserves because economic and engineering data to project mining and development costs and coal resource market values are not available. EIA's recoverable reserves at active mines, about which EIA is authorized to collect simple tonnage and recovery rate estimates in its annual *Coal Production Report* survey, rely on mine operator estimates, and cannot be classified as to geologic assurance (see "Measured Resources" in "Important Terminology" box).

Originally developed for use in EIA coal supply models, the data in the first report[1] (1989) were published to broaden communication with the public on the available data and analyses of coal resources and their characteristics and to refine estimates of the resources that may be recoverable and suitable for future needs. The second report,[2] published in 1993, included new State data in major portions of Ohio and Wyoming, resulting in significant revisions. It also contained EIA revisions in the Pennsylvania anthracite coal fields and Btu/sulfur range allocations for the DRB in parts of 10 other, nonproducing States. For the first time, coal quality and recoverability estimates were available for all States with DRB data. The third report,[3] released in 1996, revised data in New Mexico, Illinois, and Eastern Kentucky and documented the increasing cooperation among EIA, the U.S. Geological Survey, and State geological agencies in order to share data and coordinate efforts in their coal resource and reserve programs. This report (the fourth) incorporates additional new resource data in Illinois and applies depletion adjustment through January 1, 1997. The DRB is the only publicly available, nationwide data file of the quantities of minable coal conforming to a unified set of criteria. The DRB provides the basic input for numerous coal and energy analysis and forecasting models—both government and private. These include the National Energy Modeling System (NEMS), EIA's integrated energy forecasting system. The NEMS forecasts are the basis for EIA's *Annual Energy Outlook*[4] and are used to answer congressional and executive department requests and *ad hoc* analyses. The DRB is also used in commercial models, such as ICF, Incorporated's Coal and Electric Utility Model.

The Demonstrated Reserve Base

The in-place coal resources in the United States, including the DRB and the identified and undiscovered resources, occur primarily as tabular deposits, or "coalbeds," within the rocks in certain coal-bearing areas (Figure 1).

The DRB predates the estimated recoverable reserves database and was originally devised to impart a uniform set of definitions and criteria and replace the compilations of variously defined coal reserve and resource data in Federal and State studies available in the 1950's and 1960's. Engineers and geologists at the U.S. Bureau of Mines (BOM) inaugurated the DRB in 1974.[5] They selected geologic reliability criteria ("measured" and "indicated") that included only resources based on multiple field measurements or resource extensions

[1] Energy Information Administration, *Estimation of U.S. Coal Reserves by Coal Type: Heat and Sulfur Content*, DOE/EIA-0529 (Washington, DC, October 1989).

[2] Energy Information Administration, *U.S. Coal Reserves: An Update by Heat and Sulfur Content*, DOE/EIA-0529(92) (Washington, DC, February 1993).

[3] Energy Information Administration, *U.S. Coal Reserves: A Review and Update*, DOE/EIA-0529(95) (Washington, DC, August 1996).

[4] Energy Information Administration, *Annual Energy Outlook*, DOE/EIA-0383 (various years) (Washington, DC).

[5] U.S. Department of the Interior, Bureau of Mines, *Mineral Industry Surveys*, "Demonstrated Coal Reserve Base of the United States on January 1, 1974" (Washington, DC, June 1974).

Important Terminology: Resources, Reserves, and the DRB[a]

"Resources" are naturally occurring concentrations or deposits of coal in the Earth's crust, in such forms and amounts that economic extraction is currently or potentially feasible.

"Measured resources" refers to coal for which estimates of the rank and quantity have been computed to a high degree of geologic assurance, from sample analyses and measurements from closely spaced and geologically well known sample sites. Under the U.S. Geological Survey (USGS) criteria, the points of observation are no greater than ½ mile apart (see Figure A1). Measured coal is projected to extend as a 1/4-mile-wide belt from the outcrop or points of observation or measurement.

"Indicated resources" refers to coal for which estimates of the rank, quality, and quantity have been computed to a moderate degree of geologic assurance, partly from sample analyses and measurements and partly from reasonable geologic projections. Under the USGS criteria, the points of observation are from ½ to 1½- miles apart (see Figure A1). Indicated coal is projected to extend as a ½-mile-wide belt that lies more than ¼mile from the outcrop or points of observation or measurement.

"Demonstrated resources" are the sum of measured resources and indicated resources.

"Demonstrated reserve base" (DRB) (or just "reserve base" in USGS usage) is, in its broadest sense, defined as those parts of identified resources that meet specified minimum physical and chemical criteria related to current mining and production practices, including those for quality, depth, thickness, rank, and distance from points of measurement. The "reserve base" is the in-place demonstrated resource from which reserves are estimated. The reserve base may encompass those parts of a resource that have a reasonable potential for becoming economically recoverable within planning horizons that extend beyond those which assume proven technology and current economics.

"Inferred resources" refers to coal of a low degree of geologic assurance in unexplored extensions of demonstrated resources for which estimates of the quality and size are based on geologic evidence and projection. Quantitative estimates are based on broad knowledge of the geologic character of the bed or region where few measurements or sampling points are available and on assumed continuation from demonstrated coal for which there is geologic evidence. The points of measurement are from 1½ to 6 miles apart (Figure A1). Inferred coal is projected to extend as a 2¼-mile-wide belt that lies more than ¾ mile from the outcrop or points of observation or measurement. Inferred resources are not part of the DRB.

"Recoverable" refers to coal that is, or can be, extracted from a coalbed during mining.

"Reserves" relates to that portion of demonstrated resources that can be recovered economically with the application of extraction technology available currently or in the foreseeable future. Reserves include only recoverable coal; thus, terms such as "minable reserves," "recoverable reserves," and "economic reserves" are redundant. Even though "recoverable reserves" is redundant, implying recoverability in both words, EIA prefers this term specifically to distinguish recoverable coal from in-ground resources, such as the demonstrated reserve base, that are only partially recoverable.

"Minable" refers to coal that can be mined using present-day mining technology under current restrictions, rules, and regulations.

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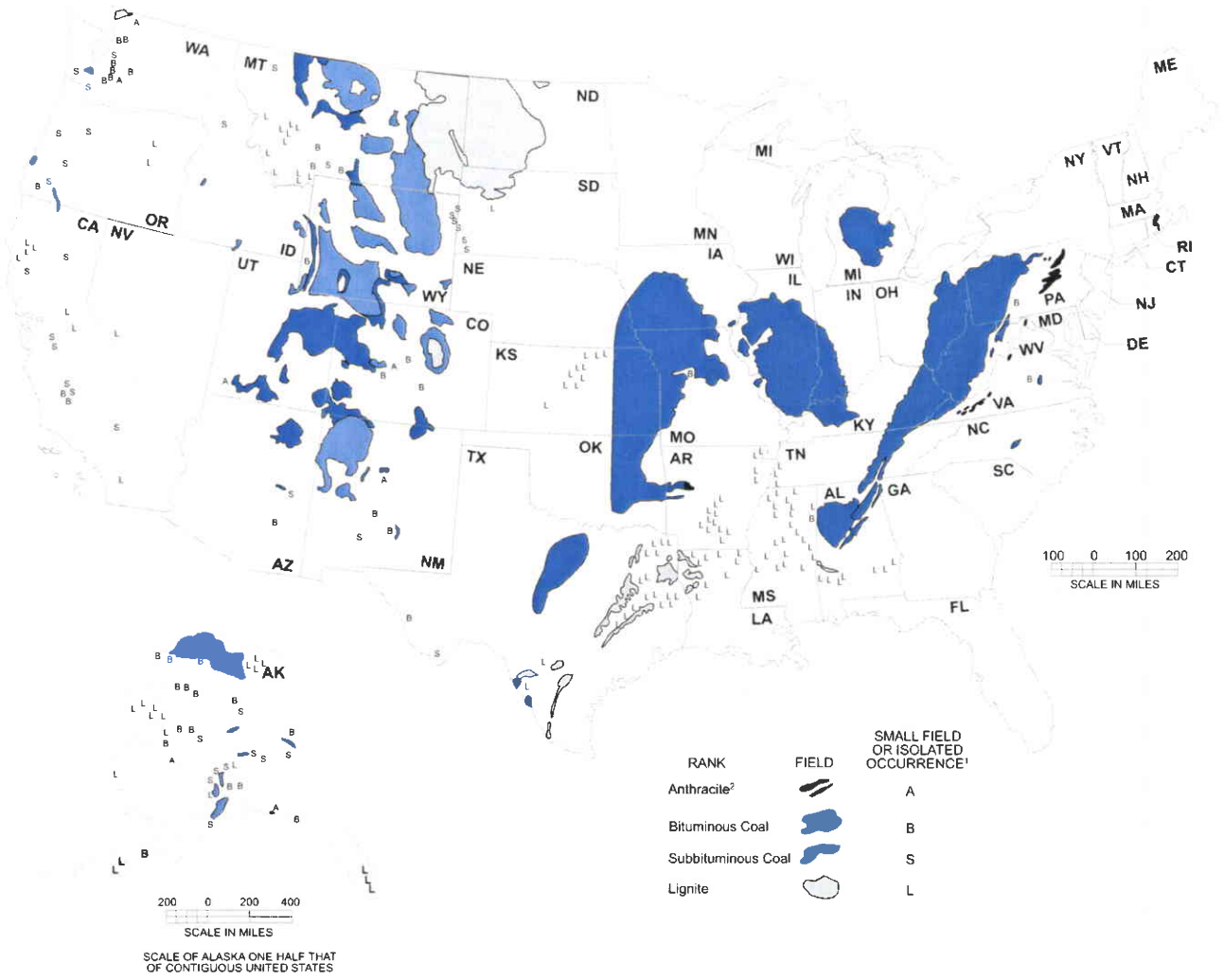
[a]For a full discussion of coal resources and reserve terminology as used by EIA, USGS, and BOM, see *U.S. Coal Reserves,* 1996, Appendix A, "Specialized Resource and Reserve Terminology."

Sources: U.S. Department of the Interior, *Coal Resource Classification System of the U.S. Bureau of Mines and the U.S. Geological Survey*, Geological Survey Bulletin 1450-B (1976). U.S. Department of the Interior, *Coal Resource Classification System of the U.S. Geological Survey*, Geological Survey Circular 891 (1983) U.S. Department of the Interior, *A Dictionary of Mining, Mineral, and Related Terms*, Bureau of Mines (1968).

corroborated by measurements, within defined study areas. Further, for the 1974 DRB, the BOM used information from field personnel and coal mining specialists and it applied engineering judgment to derive what has turned out to be a one-time national assessment at the county/coalbed level.[6] Working with the thickness categories common to contemporary coal assessments, they selected as minability criteria those broad ranges of coalbed thickness and overburden thickness that encompassed most commercial mining.

[6] U.S. Bureau of Mines, *The Reserve Base of U.S. Coals by Sulfur Content: Part 1, The Eastern States,* Information Circular 8680 (Washington, DC) and U.S. Bureau of Mines, *The Reserve Base of U.S. Coals by Sulfur Content: Part 2, The Western States,* Information Circular 8693 (Washington, DC, 1975). The first DRB determined by the BOM was improperly labeled as the 1974 DRB; actually, it was estimated for 1971, and subsequent DRB updates by the EIA reflect depletion adjustments from 1971.

Figure 1. Coal-Bearing Areas of the United States



Sources: United States Geological Survey, *Coalfields of the United States, 1960-1961*; Texas Bureau of Economic Geology, *Lignite Resources in Texas, 1980*; Louisiana Geological Survey, *Near Surface Lignite in Louisiana, 1981*; Colorado Geological Survey, *Coal Resources and Development Map, 1981*; and Mississippi Bureau of Geology, 1983.

For a discussion of the significance of the data and criteria on updates of the DRB and related databases, see Appendix A of the 1996 *U.S. Coal Reserves* report.

The EIA assumed responsibility for the DRB and for coal reserves data in 1977, when DOE was established. Between 1983 and 1993, EIA published annual updates to the DRB in its annual *Coal Production* reports.[7] Because of differences between DRB data and the production data as reported by coalbeds the EIA updates could be maintained only at the State level, by coal rank and type of mining. Some State updates by EIA incorporated new resource data by coalbed, but it was not feasible to maintain the national DRB at the coalbed level. DRB updates during the 1980s also broadened criteria in locations where evidence showed that coal was being mined from beds thinner or deeper than the standards (Appendix A, 1996 *U.S. Coal Reserves* report).

[7] Energy Information Administration, *Coal Production*, DOE/EIA-0118 (Washington, DC, various years).

In 1990, EIA initiated the Coal Reserves Data Base (CRDB) program, to help meet the growing need for new sources of data for U.S. coal reserves estimates. Years of unpublished mapping data and coal quality data from various sources were being warehoused at State geological surveys in a wide range of formats. In order to promote the processing, analysis, and promulgation of such data, EIA encourages active participation of State surveys in the CRDB program.

The resulting CRDB coal resource estimates include the DRB, along with accessibility adjustments, estimated recoverable reserves (recoverable coal), and allocations by Btu, sulfur, and ash content using coal quality data that are coordinated with mapped resources.

Coal Resource Data Framework

The DRB is part of a larger system of coal resource data and EIA's estimates of coal reserves are part of a hierarchy of U.S. Government coal resource assessment data (Figure 2). The U.S. Geological Survey (USGS) performs mapping and field studies required to calculate identified coal resources, and it may estimate undiscovered resources from extensions of available data, based on known geologic information. State geological surveys also may map coal resources, and many do so in cooperation with the USGS and have adopted USGS criteria as their standards.

EIA's objective is to develop reliable data on coal reserves, but the coal reserves data EIA is authorized to collect from the coal industry are too limited for mid- or long-term analyses. To supply a broader national database of coal reserves, EIA analyzes coal resource data—primarily the DRB, but also the other measured, indicated, and inferred resource categories from which the DRB might be derived. EIA develops the estimated recoverable reserves from the DRB and from data on coal accessibility and recoverability. The USGS and State geological surveys estimate identified resources (which include measured and indicated resources from which the DRB may be derived, as well as resources currently too thin or too deep to include in the DRB) and inferred resources, also not included in the DRB. Finally, the undiscovered resources estimated by the USGS, along with identified resources, constitute the comprehensive "total resources" classification (Figure 2).

Although all the data represented in Figure 2 are interrelated conceptually, in practice they cannot be maintained uniformly. The recoverable reserves at active mines are updated annually but they represent only a fraction of the reserves controlled by major mining companies. EIA treats recoverable reserves at active mines as though they constitute a portion of its estimated recoverable reserves. In reality, some of the data at mines may incorporate reserves located beyond the coverage of the DRB and EIA's estimated recoverable reserves. The mine data EIA receives are not detailed enough to allow comparative analysis.

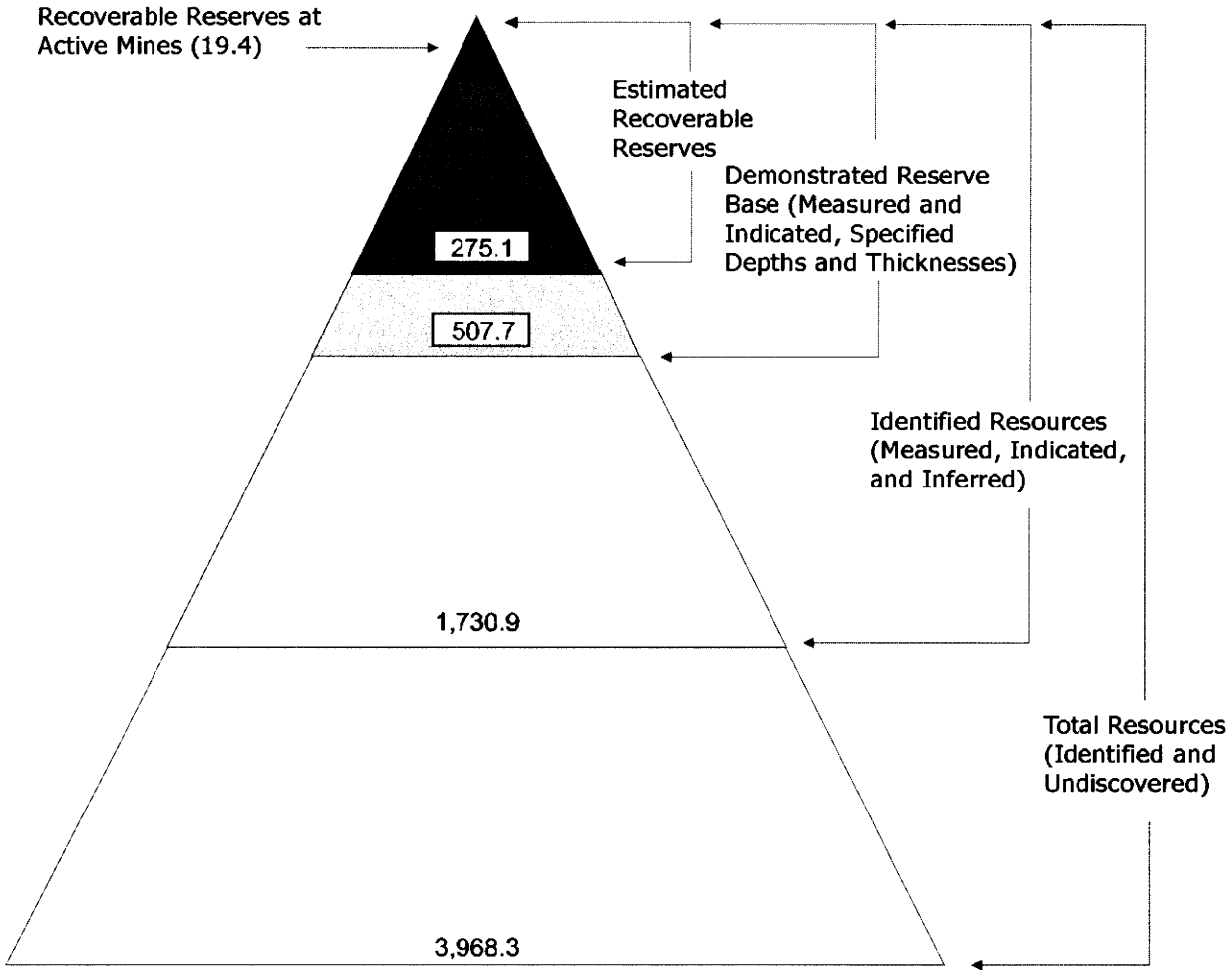
Further, the data for reserves at active mines are clearly more timely than the broader resource studies from which estimated recoverable reserves are derived. Similarly, the DRB data are derived from more recent sources in many areas than were available when the USGS compiled identified resources and total resources as of 1974. Thus, in Figure 2, the data for active mines are generally more current than the DRB and its associated recoverable reserve estimates, which are in turn more up to date than much of the total resource data. Under current planning, there is little likelihood that total resources of coal will be updated by the USGS in the near future.

Recent Developments

By definition, the DRB does not represent all the coal in the ground. It represents coal that has been mapped, that meets DRB reliability and minability criteria, and for which the data are publicly available. In some areas, the available source data for the DRB are old, and there may be evidence that some coal being mined is not covered in the DRB. In such cases, the DRB is presently out of date. As new data become available, those coal resources are revised via the CRDB program as new data become available. It is considered evidence that resource data and the DRB are out of date if reserves being mined supersede in quantity, location, or physical parameters the resources that have been demonstrated using available data. In isolated cases of this kind, EIA has selectively included inferred coal resources, not in the DRB, but in the data base used to develop certain coal supply forecasts.

Inferred coal resources are not listed in this report because they are less reliable than the DRB and because the coverage of inferred data is not consistent from one State to another. Recent CRDB studies include updated DRB and inferred resources and they extend allocations and analyses to the inferred if supported by the geologic evidence. Even though inferred data are not published by EIA, they are retained on file to supply information about mining potential in important areas.

Figure 2. Delineation of U.S. Coal Resources and Reserves
(Billion Short Tons as of January 1, 1997)



Notes: Resources and reserves data are in billion short tons. Darker shading in the diagram corresponds to greater relative data reliability. The estimated recoverable reserves depicted near the top of the diagram assume that the 19 billion short tons of recoverable reserves at active mines reported by mine operators to the Energy Information Administration (EIA) are part of the same body of resource data. This diagram portrays the theoretical relationships of data magnitude and reliability among coal resource data. All numbers are subject to revision with changes in knowledge of coal resource data.

Sources: The DRB estimate was compiled by the EIA as of January 1, 1997. Estimated recoverable reserves were compiled in EIA's Coal Reserves Data Base (CRDB) program. Recoverable reserves at active mines were reported in EIA's *Coal Industry Annual, 1996.* Identified resources and total resources are estimates as of January 1, 1974, compiled and published by the U.S. Geological Survey in *Coal Resources of the United States, January 1, 1974.*

Since EIA's previous report, in 1996, data have been incorporated from Part 2 of the Illinois CRDB study, completed in March 1997 (described in the next section). A cooperative agreement is under way with the Colorado Geological Survey to revise coal resource estimates and update the CRDB in the two leading coalfields in Colorado. Results from the Uintah coalfields were completed in July 1998[8] and updates for the Yampa field are due by May 1999. A coal reserves update study in Utah, in cooperation with the Utah Geological Survey, started up in December 1997. New resource and reserve estimates for the major producing areas in the Book Cliffs and Wasatch Plateau coalfields are scheduled for completion by August 1999.

EIA has obtained valuable new accessibility and recoverability data for recent coal reserve estimates from the USGS Coal Availability Studies (CAS) and from the BOM Coal Recoverability Studies (CRS) conducted before the Bureau of Mines was shut down. The USGS, recognizing the value of the CRS to complement its availability studies with economic mining feasibility data, included a small CRS program in its current operations. As discussed later, EIA has also adopted some of the CAS criteria for "restricted resources" in its own accessibility adjustments. This allows the DRB criteria to remain constant while using accessibility factors to update local coal minability restrictions.

The USGS is also proceeding with its National Coal Resource Assessment (NCRA)—a project running from 1995 to 1999 to update basic U.S. coal resources data. The NCRA is incorporating new data in a systematic study of designated major coal deposits: specifically of those coalbeds expected to produce the majority of U.S. coal for the next 25 to 30 years. It does not attempt to compile the data necessary for a new estimate of total U.S. coal resources, which would currently be beyond the scope of any fundable Federal project. When completed, the NCRA data may serve an important role in updating or replacing EIA's DRB.

[8] The new Colorado data are being reviewed and processed. They are not included in the present update.

2. New Coal Resource and Reserve Data in Illinois

Overview

The identified resource, demonstrated reserve base (DRB), and estimated recoverable reserves data for the State of Illinois were updated in a two-part cooperative agreement between EIA and the Illinois State Geological Survey (ISGS). The first part was completed in November 1995 for resources in those parts of the Illinois coalfield where new data were available that could be fully integrated during the initial 12-month project period.[9] Those data were incorporated in EIA's subsequent coal reserves report and database.[10] The final part of the cooperative agreement was completed in March 1997.[11] It incorporated additional new file data for which broader analysis was required—data which might demonstrate coal resources of low- to medium-sulfur content or resources in areas previously without reliable DRB estimates. Those data are incorporated via the present report and database.

The new DRB of coal in Illinois, calculated by the ISGS as of January 1, 1996, was 105.16 billion short tons (Table 1). This compares with 78.01 billion short tons prior to the ISGS project (remaining DRB, as of January 1, 1993[12]) and with 90.05 billion short tons following the first part of the update (remaining as of January 1, 1994).

Compared on the same remaining-year basis, the DRB estimate in Illinois increased by more than 35 percent, or 27.4 billion short tons. EIA adjusted the new Illinois DRB for depletion during 1996, resulting in a DRB of 105.07 billion short tons remaining as of January 1, 1997.

The new estimate includes resources revised using recent mapping in 16 counties, as well as adjustments throughout most of the 72 counties included in the study for depletion due to past mining. The new estimate for identified resources is 199 billion short tons, as compared with EIA's previous file data totaling estimate of 181 billion short tons. These coal resource estimates are neither ultimate nor definitive; they represent qualifying data obtainable at reasonable cost at the time of study for mapped coal resources in the areas and depths likely to be minable. As with all DRB estimates, they do not include hypothetical or inferred resources or coal deposits too thin, too deep, or too impure to mine.

The new resource estimates incorporate analyses of sulfur, heat content, and coal rank to characterize the remaining coal resources in Illinois. Relevant coal quality data were examined in conjunction with coal resource mapping. Coal analyses from exploration drill holes and channel samples at mines and outcrops were compiled and mapped, along with data on geologic trends, to allocate coal resources to ranges of sulfur and heat content and to rank group. The new allocations place almost 1 percent of the DRB of Illinois in the two lowest sulfur categories, as compared with none in EIA's 1993 reserve base. These allocations also place 89 percent of the DRB in the highest sulfur category, as compared with EIA's allocation of 69 percent in 1993.

By comparing depletion of reserves as calculated from maps of mined areas with depletion based on reported production and recovery rates, ISGS uncovered potential pitfalls in estimating depletion based on reported production alone, without adequate knowledge of mine operations. The issues include production data reported on the basis of tipple location rather than point of extraction and depletion by underground mining of reserves classified as surface-minable in the database. The destruction of unmined reserves by preferential mining of lower seams is also an important issue but it could not be estimated from the statistics.

[9] Illinois State Geological Survey, *Illinois Coal Reserve Assessment and Data Base Development: Final Report for Part 1*, Open-File Series, 1995-11, published report prepared for the Energy Information Administration (Champaign, IL, 1995).

[10] Energy Information Administration, *U.S. Coal Reserves: A Review and Update*, DOE/EIA-0529(95) (Washington, DC, August 1996).

[11] Illinois State Geological Survey, *Illinois Coal Reserve Assessment and Data Base Development: Final Report*, Open-File Series, 1997-4, published report prepared for the Energy Information Administration (Champaign, IL, 1997).

[12] Energy Information Administration, *Coal Production 1992*, DOE/EIA-0116(92) (Washington, DC, October 1993).

Table 1. Estimates of the Demonstrated Reserve Base and Estimated Recoverable Reserves of Bituminous Coal in Illinois by Btu/Sulfur Range and Type of Mining
(Million Short Tons Remaining as of January 1, 1996)

Heat content (million Btu per short ton)	Sulfur Content (pounds of sulfur per million Btu)							Total All Sulfur Categories
	< 0.40	0.41–0.60	0.61–0.83	0.84–1.24	1.25–1.67	1.68–2.50	> 2.50	
Demonstrated Reserve Base								
Minable from Surface								
15-19.99 . . .	0.00	0.00	0.00	0.00	0.00	8.84	121.98	130.82
20-22.99 . . .	0.00	0.00	4.16	161.45	132.20	501.23	14,102.65	14,901.71
23-24.99 . . .	0.00	0.00	1.36	26.42	20.12	80.81	1,084.50	1,213.21
25-25.99 . . .	0.00	0.00	0.00	0.00	0.00	0.00	372.25	372.25
Total	**0.00**	**0.00**	**5.52**	**187.87**	**152.33**	**590.88**	**15,681.39**	**16,617.99**
Minable Underground								
20-22.99 . . .	199.42	683.74	1,089.46	1,660.13	1,220.92	2,439.41	48,028.67	55,321.75
23-24.99 . . .	2.44	34.08	255.55	874.93	650.75	1,509.48	28,712.89	32,040.12
25-25.99 . . .	0.00	0.00	0.00	0.00	0.00	0.00	1,167.04	1,167.04
>25.99	0.00	0.00	0.00	0.00	0.00	0.00	9.45	9.45
Total	**201.86**	**717.82**	**1,345.02**	**2,535.06**	**1,871.67**	**3,948.88**	**77,918.06**	**88,538.37**
Minable Total								
15-19.99 . . .	0.00	0.00	0.00	0.00	0.00	8.84	121.98	130.82
20-22.99 . . .	199.42	683.74	1,093.63	1,821.58	1,353.12	2,940.64	62,131.33	70,223.46
23-24.99 . . .	2.44	34.08	256.91	901.35	670.87	1,590.28	29,797.40	33,253.33
25-25.99 . . .	0.00	0.00	0.00	0.00	0.00	0.00	1,539.30	1,539.30
>25.99	0.00	0.00	0.00	0.00	0.00	0.00	9.45	9.45
Total	**201.86**	**717.82**	**1,350.54**	**2,722.93**	**2,023.99**	**4,539.76**	**93,599.45**	**105,156.40**
Estimated Recoverable Reserves								
Recoverable from Surface								
15-19.99 . . .	0.00	0.00	0.00	0.00	0.00	5.22	71.18	76.41
20-22.99 . . .	0.00	0.00	2.48	110.69	87.11	303.37	8,586.19	9,089.84
23-24.99 . . .	0.00	0.00	0.70	0.72	4.46	30.94	682.05	718.86
25-25.99 . . .	0.00	0.00	0.00	0.00	0.00	0.00	226.75	226.75
Total	**0.00**	**0.00**	**3.18**	**111.41**	**91.57**	**339.53**	**9,566.17**	**10,111.86**
Recoverable Underground								
20-22.99 . . .	45.58	176.75	325.61	450.29	356.33	696.70	15,180.30	17,234.57
23-24.99 . . .	0.54	8.29	80.18	316.55	226.24	554.23	9,435.98	10,622.01
25-25.99 . . .	0.00	0.00	0.00	0.00	0.00	0.00	266.76	266.76
Total	**46.12**	**185.04**	**405.79**	**766.85**	**582.58**	**1,250.93**	**24,883.03**	**28,120.34**
Recoverable Total								
15-19.99 . . .	0.00	0.00	0.00	0.00	0.00	5.22	71.18	76.41
20-22.99 . . .	45.58	176.75	328.09	560.99	443.45	1,000.07	23,766.48	26,321.41
23-24.99 . . .	0.54	8.29	80.88	317.28	230.70	585.17	10,118.03	11,340.88
25-25.99 . . .	0.00	0.00	0.00	0.00	0.00	0.00	493.51	493.51
Total	**46.12**	**185.04**	**408.96**	**878.26**	**674.14**	**1,590.47**	**34,449.20**	**38,232.20**

Note: Data may not equal sum of components due to independent rounding.
Source: Illinois State Geological Survey, *Illinois Coal Reserve Assessment and Data Base Development: Final Report*, Open-File Series 1997-4.

The January 1, 1996, accessible reserve base was estimated at 69.56 billion short tons. EIA's previous (January 1, 1992) accessible reserve base estimate of 56.49 billion tons excluded surface-minable coal under prime farm land, an exclusion that is no longer considered valid. The new estimate excludes: resources under towns, interstate highways, and public land; underground-minable resources less than 4 feet thick; resources in small, irregular blocks between mines; and coal allocated for barriers and small blocks left in future mines. For underground mining, the coal accessibility based on land use restrictions related to surface features ranges from 42 percent to 100 percent, varying by coalbed and county. These basic accessibility rates were further reduced to account for irregular blocks of coal and barriers expected to be left unmined, and to exclude coal less than 42 inches thick.[13] For surface mining, a net accessibility factor of 80 percent or less was applied to all coalbeds and counties. This was based on these extrapolations: (1) that on average, 15 percent of future minable coal will be inaccessible because of barriers between mine blocks and at property boundaries and because of irregularly shaped isolated resource blocks that cannot economically be accessed; and (2) that another 6 percent, on average, is expected to be restricted due to land use conflicts. In addition, specific accessibility-limiting restrictions were identified in several counties.

The ISGS is currently involved in a multiyear study supported by the USGS to assess the availability of coal for mining. When complete, the findings from the Coal Availability Studies are expected to lead to additional adjustments in the accessible reserve base.

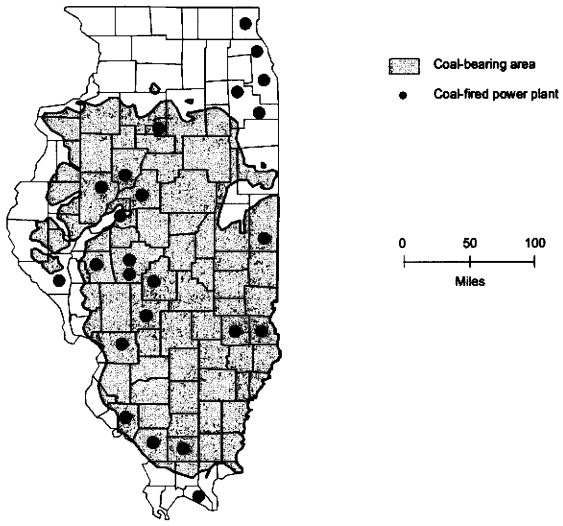
Estimated recoverable reserves of 38.23 billion short tons as of January 1, 1996, were calculated using recovery factors of 50 percent for underground-minable reserves and 70 to 85 percent (depending on location and thickness) for surface-minable coal (Table 1). These rates are similar to the traditional 50 percent and 80 percent rates, respectively, used previously in DRB calculations. They were selected, however, based on data on reserves depletion and mine production from January 1979 to January 1996, rather than on the regional resource depletion factors applied to the DRB and traditionally assumed to account for inaccessible resources as well. The revised recovery rates account both for coal that would be lost in cleaning and handling and for coal left as pillars or barriers in mines.

Study Area

The Illinois coalfield (Figure 1) is in the Interior Region of the United States and contains most of Illinois (Figure 3) as well as western portions of Indiana and Kentucky. Minable coal is found in the Pennsylvanian-age strata of the geologic basin. The rank of the coals is high volatile bituminous, ranging from the A rank group at the extreme southern margin of the basin to rank groups B and C in the southern, central, and northern portions of the basin. Illinois has the largest DRB of bituminous coal and the second largest total DRB of any State.

Since the development of modern surface mining equipment, coals as deep as 150 feet have commonly been mined by surface methods in Illinois. Large dragline and power shovel mining or small truck and shovel operations are the primary forms of surface mining. Augering is sometimes used to recover additional coal from the final cut of a surface mine.Shafts and slopes are the most common means of access to underground mines in this region, but some mines employ a drift entrance constructed at an abandoned surface mine highwall or a box cut.[14] Partial- and high-extraction room-and-pillar

Figure 3. Coal-Bearing Areas of Illinois



Source: United States Geological Survey, *Coalfields of the United States*, 1960.

[13] About 5 percent of the coal in the less than 42-inch category was mapped using prior criteria and includes beds as thick as 47 inches; hence it is identified in the study both as less than 42 inches and as less than 4 feet thick.

[14] A drift mine typically enters the coalbed directly at a location where the coal and overlying rocks are exposed, such as a natural hillside. In Illinois, drift mines sometimes access the coal seam via an artificial exposure, such as a "final cut" high wall, where the overburden becomes too thick for further surface mining, or in a box-like pit excavated specifically to create an exposure surface in the coal seam.

mining and longwall mining methods are used. During the past 20 years, production has shifted from entirely room and pillar to more than 40 percent from longwall operations.

Methodology and Criteria

In the early 1950s, the ISGS completed the first comprehensive survey of coal resources in the State.[15] The landmark report on the survey results, published in 1952, provided a framework and format generally followed in subsequent resource assessments. In particular, it established reliability categories that reflect the above average lateral continuity of most coals found in Illinois (Table 2). The 1952 report is also the only source of resource and reserve estimates for a few seams that have not attracted sufficient interest to warrant revised mapping.

The ISGS categories of reliability are comparable to those defined by the USGS. Because of the lateral continuity of most Illinois coals, however, the radii of influence assigned to each datum point are larger than those used by the USGS. The ISGS categories of class I-A, I-B, and II-A are considered equivalent in reliability to the USGS categories of measured, indicated, and inferred and had previously been accepted as such in EIA coal resource data.

Although the DRB did not exist at the time of the 1952 report, the criteria used in the study are compatible with current DRB definitions and would indicate a DRB of 61 billion tons. Additional mapping since 1950 raised the DRB to 78 billion tons as of January 1, 1993.

The ISGS began computerizing its coal resource mapping in the 1960s. Computers expedite merging of coal thickness data with data on coal depth, sulfur, rank, heating value, and mined areas, and with other information such as calculated depletion, accessibility, and recoverability of reserves. Subsequent updates, revisions, and accessibility adjustments can also be made more efficiently with a digital database.

Many of the coal resource maps needed for this study were already in a digital format of some kind. For this study, all data were combined into a common digital map database to facilitate processing as well as to provide a suitable foundation for future updates and revisions. All remaining paper maps were digitized into the common database and numerous adjustments were made to edge match and correlate all data from earlier databases and base maps.

Resources and reserves were divided into two categories based on the mining method most likely to be used. The surface-minable category consists of coals that would be mined most likely by removing the overburden to expose and excavate the coal. The underground-minable category consists of resources expected to be extracted by underground methods such as room-and-pillar or longwall mining.

The factors that determine the method used to mine a particular deposit are primarily economic rather than technical. The main factors are: thickness of the coal, average stripping ratio of the mine block, nature of the overburden material, surface ownership and land use,

Table 2. Reliability Classifications for Coal Resources in Illinois

Class	Maximum Distance from Datum Points*	Accepted Datum Points	Remarks
I-A Proved (Measured)	0.5 mile	Mined-out areas, Diamond drill holes, Outcrops, Coal test geophysical logs	Approximately equivalent to *measured* category of the U.S. Geological Survey
I-B Probable (Indicated)	2 miles	All points of Class I-A plus coal-test churn drill holes	Approximately equivalent to *indicated* category of the U.S. Geological Survey
II-A Strongly Indicated (Inferred)	4 miles	All points of Classes I-A and I-B plus churn drill holes drilled for oil or water with unusually good records, control rotary drill holes and oil-test geophysical logs	Approximately equivalent to *inferred* category of the U.S. Geological Survey

* Distances modified in practice by geological considerations.
Source: Adapted from ISGS Bulletin 78, 1952.

[15] Illinois State Geological Survey, *Minable Coal Reserves of Illinois*, Bulletin 78 (Champaign, IL, 1952) 138 pp.

proximity to other surface features, and the capital and previous mining experience of individual companies.

The ISGS found the 150-foot depth line to be the most representative average delimiter between surface-minable and underground-minable resources. In Illinois, the ISGS defines surface-minable resources as having a minimum thickness of 18 inches. Underground-minable resources are defined as having a minimum thickness of 28 inches. These minimum thicknesses are based on historical mining practice in the State. For economic reasons, seams less than 48 inches thick have not been extensively mined underground in Illinois for the past three decades or more; however, resources less than 48 inches thick were retained in the DRB for this study in order to provide compatibility with current DRB estimates of other midwestern States. As explained later, those seams are excluded from the accessible reserve base.

The categories of coal seam thickness and overburden thickness followed in Illinois are summarized in Tables 3 and 4. No maximum depth was established for underground-minable reserves. The deepest mapped resources in the State are slightly more than 1,500 feet below the surface. Interviews with representatives of mining companies indicated that this depth does not prevent mining.

Table 3. Categories of Coal Seam Thickness in Illinois

Thickness Range[a] (inches)	Average Thickness (feet)
18-28	[b]2
28-42	3
42-54	4
54-66	5
66-78	6
78-90	7
90-102	8
102-114	9
≥ 114	10

[a]Thickness ranges expressed in even-inch values represent the isopach contour lines mapped to define areas of average thickness. Isolated thicknesses cor- responding to the upper limit of a range are included in the next thicker range.

[b]Surface-minable coal only.

Source: *Illinois Coal Reserve Assessment and Data Base Development: Final Report*, Open-File Series 1997-4, 1997.

Table 4. Categories of Overburden Thickness

Underground Mining (feet)	Surface Mining (feet)
150-500	0-50
500-1,000	50-100
1,000-2,000	100-150

Note: Thickness ranges expressed in even-foot values represent the isopach contour lines mapped to define areas of average thickness. Isolated thicknesses corresponding to the upper limit of a range are included in the next thicker range.

Source: *Illinois Coal Reserve Assessment and Data Base Development: Final Report*, Open-File Series 1997-4, 1997.

The thicknesses of coal deposits were mapped using contour lines at one-foot intervals. Coal tonnages were calculated using a density factor of 1,800 tons per acre per foot of coal thickness (equivalent to 1.32 specific gravity). The mean value of the two contours defining an area was used for this calculation. For example, the area between the 5.5-foot and 6.5-foot isopachs was assumed to have an average thickness of 6 feet.

Cumulative depletion of the DRB was calculated and analyzed both using information on mined areas and using production data and recovery factors. The results were compiled by ISGS to update the DRB to January 1, 1996, and to provide comparative statistics on reported production and depletion of reserves. EIA depleted the DRB from January 1, 1996, to January 1, 1997, using EIA production data and standard depletion factors.

Resources were allocated to EIA coal quality categories for sulfur, rank, and calorific value. Face channel, column, composite bench, and drill core samples were used in this study (See "coal sampling" in Glossary). ISGS has on file more than 4,000 analyses of Illinois coal, the majority of which are of the face channel type. These samples were collected and analyzed by ISGS staff, the U.S. Bureau of Mines, or coal companies. All Illinois coals are high-volatile bituminous. Coal rank varies systematically with distribution and depth of the deposit in the coal field. Rank was determined by calculating the heating value of samples on a moist, mineral-matter-free basis, according to formulas of Standard D388, American Society for Testing and Materials.[16] The coal analyses were used to map million Btu per ton and pounds of sulfur per million Btu on an as-received basis and to assign corresponding coal resources to the Btu/Sulfur ranges used in EIA allocations.

[16] American Society for Testing and Materials, *Annual Book of ASTM Standards*, Section 5, Petroleum Products, Lubricants, and Fossil Fuels, Volume 5.05: Gaseous Fuels, Coal and Coke (Philadelphia, PA, 1990).

Coal Accessibility Adjustments

The accessible reserve base can be described as the portion of the DRB that can be mined at present, when local or regional mining practice and technologies and physical or geologic conditions are taken into account. For recent resource studies and revisions, EIA has broadened the concept of accessibility to include the limiting effects of certain technological and geologic conditions. In the past, such adjustments were made in the resource database, by the field investigator or within the DRB derivation, and were difficult to reassess. They can now be applied through computerized resource mapping systems and they enhance the comparability of EIA coal accessibility and USGS coal availability. The expanded definition has been incorporated into the Illinois study. The accessible reserve base includes that portion of USGS available resources that would meet DRB criteria.

At the end of the EIA cooperative agreement, the ISGS was in the third year of a multiyear USGS Coal Availability Study (CAS). Five quadrangles had been evaluated, about 20 percent of the number needed to reliably assess availability of resources in Illinois. The amount of coal available for mining in the sample areas ranged from 18 percent to 61 percent of the original resources. Technical factors such as thickness of the coal and overlying bedrock, roof and floor conditions, faults, and size of the mining block account for most of the restrictions on coal availability. Land use restricts from less than 1 percent to 16 percent of the resources in the quadrangles studied. Although it was too early to apply most of the initial findings of this study, some preliminary observations were incorporated into this estimate of accessible resources. Final findings of the CAS are expected to significantly alter the accessible reserve base. The factors considered for estimating the accessible reserve base are listed in Table 5.

Almost 60 percent of the 36 million acres of land in Illinois are classified as prime farmland. EIA's estimate of accessible coal in Illinois had excluded surface-minable reserves in areas of prime farmland, but Illinois surface mine regulations do not preclude mining these areas. Further, surface mine operators in Illinois are successfully mining and reclaiming prime farmland, and in CAS interviews with operators, they did not consider it a limit to reserve accessibility. For these reasons, prime farmland was not a factor in estimating the new accessible reserve base.

Since 1952, the ISGS had excluded areas densely drilled for oil from its calculation of reserves. Coal mining experts interviewed by Treworgy and Bargh in 1981[17] confirmed this restriction and the amount of coal excluded (9.6 billion tons) was documented. The thinking was that safety considerations prevent mining coal in such areas. In the CAS, however, it was found that mining companies no longer regard closely spaced oil wells as an absolute barrier to mining. Although regulations require that a barrier pillar be left around wells, experienced mining companies have been allowed to reduce the size of the pillar. In many cases of abandoned wells, it has been feasible to plug the well to meet specifications and then mine through it. The decrease in the amount of coal recovered and/or the increase in the cost of mining is not severe enough to consider the reserves inaccessible.

The five CAS quadrangles completed by the end of the Coal Reserves Data Base (CRDB) study contain about 2 percent of the underground-minable resources in the State and include all the major seams. Six of the eight companies operating major underground mines in the State were interviewed. All six considered coal less than 42 inches thick as presently too thin to mine economically by underground methods. Because there are few natural outcrops, most underground mines require extensive exploratory and development drilling to obtain data for mine planning and permitting and for the construction of slopes and shafts for the movement of air, miners, materials, and coal. To recoup these expenses, mines must produce large tonnages of low-cost coal. Mining in thin seams requires more acreage and the mining costs are higher. For these reasons, underground-minable reserves less than 42 inches thick[18] have been excluded from accessibility in this update.

A significant portion of inaccessible resources consists of blocks of coal left as barrier pillars (the law requires 200 feet between mines) or simply left out because of the geometry of the mine plan, the early abandonment of a mine, inability to obtain land ownership or mineral rights, or unfavorable geology. Once surrounded by abandoned mines, these blocks are too small or irregular to be minable. The approximate area of coal rendered inaccessible by mining was calculated by creating a 200-foot buffer around each mine and adding to that any areas of coal considered to be unminable because of small mining-area size, convoluted geometry, or proximity to mined areas. The coal tonnage in the adjusted

[17] Illinois State Geological Survey, *Deep-Minable Coal Resources of Illinois*, Circular 504 (Champaign, IL, 1982).

[18] About 5 percent of the coal in the less than 42-inch category was mapped using prior criteria and includes beds as thick as 47 inches.

buffer areas was calculated and excluded from the accessible reserve base.

Additional blocks will become inaccessible as mining continues. The ISGS found that, on a county-by-county basis, the amount of inaccessible coal ranged from 6 percent to more than 40 percent of the original resources in mined areas, or roughly 20 percent on a Statewide basis. Since some of this coal may have been left because of surface features, which are accounted for separately, it was estimated that 15 percent of the coal otherwise qualified for the accessible reserve base will be rendered inaccessible by future mining.

Earlier investigations have identified land uses such as interstate highways, railroads, cemeteries, towns, and public lands as factors that limit the accessibility of coal. However, changes in mining practice and findings from CAS indicate that land use restrictions have changed. For this assessment, an interim 94-percent rate of accessibility was applied to the surface-minable DRB in all counties to account for land use restrictions. This figure was chosen because it coincides with the statewide average for underground-minable reserves and is midrange for the surface-minable resources in the CAS quadrangles studied to date.

Other factors that restrict the accessibility of reserves include insufficient thickness of bedrock overburden, insufficient thickness of or incompetent interburden, and unfavorable roof and floor conditions. The impacts of these factors are not fully studied at this time, but at the completion of the Illinois CAS, the accessible reserve base may be adjusted to include as many of these factors as practical. The January 1, 1994, accessible reserve base is considered more accurate than the previous data even though based partly on preliminary CAS data.

Recovery Rates

EIA provided data on reported recovery rates from individual mines in Illinois for the years of 1991 to 1993. These data were compared with regional recovery rates calculated from depletion (measured from resource maps) and production data (compiled from State reports).

Recovery rates for underground reserves were calculated by comparing cumulative depletion of underground reserves with reported production. For those counties where a valid comparison could be made, recovery rates for the period 1979 through 1993 ranged from 40 percent to 58 percent on a county and seam basis, averaging 48 percent for all seams and counties combined. This agrees with EIA's data for 1991 through 1993, which show a weighted average recovery rate of 50 percent for all underground mines. Based on these statistics, a factor of 50 percent was used to calculate remaining recoverable underground-minable reserves.

Table 5. Factors Considered and Applied in Illinois to Estimate the Accessible Reserve Base

Factor Considered	Applied?	Remarks
Technical		
Prime farmland	No	There is no evidence that prime farmland restricts access.
Areas densely drilled for oil	No	The presence of wells does not raise costs enough to restrict access.
Barrier pillars and small blocks between mines	Yes	Tonnage of existing blocks and barriers was calculated from maps. Tonnage of blocks and barriers created by future mining was estimated to be 15 percent of reserves otherwise accessible.
Thin coal	Yes	Underground-minable reserves <48 inches thick were excluded.
Land Use		The tonnage of underground-minable reserves restricted by all land use categories was estimated from previous mapping; 6 percent of all surface-minable reserves was assumed to be inaccessible because of land use.
Interstate highways	Yes	
Towns	Yes	
Cemeteries	Yes	
Public lands	Yes	

Source: *Illinois Coal Reserve Assessment and Data Base Development: Final Report*, Open-File Series 1997-4,1997.

Consideration was given to using a higher recovery rate in counties where longwall mining is being practiced; however, EIA data did not show consistently higher recovery rates at mines operating longwalls. This is probably due to the influence of such factors as geology, amount of coal preparation, and development stage of individual mines. A valid comparison between depletion and production could not be made in several counties where reported production included production from outside the county, or underground-minable reserves were depleted by surface mining, or production was too limited to measure depletion at the scale of mapping.

EIA data for individual surface mines for 1991 through 1993 showed recovery rates ranging from 60 to 90 percent, with a weighted average of 75 percent. These figures compare favorably with recovery rates in selected counties, as calculated from cumulative depletion of surface-minable resources and reported cumulative production from surface mines. Both the EIA data and the ISGS cumulative depletion data from base year of mapping to 1994 indicate that recovery rates are lower for thinner seams or seams with many impurities. For example, the Herrin Coal in the northwestern part of the State commonly contains impurities—a widespread parting known as the "blue band" and prevalent occurrences of "white top" and clay dikes. Based on these data, a recovery rate of 70 percent was used in this study to calculate surface-minable reserves for seams less than 42 inches thick or for the Herrin Coal in northwestern Illinois. A recovery rate of 85 percent was used for all other surface-minable reserves.

3. 1997 Demonstrated Reserve Base and Estimated Recoverable Reserves

Demonstrated Reserve Base

The demonstrated reserve base (DRB) of coal in the United States as of January 1, 1997, contains an estimated 508 billion short tons (Table 6). This is an increase of 12 billion short tons over the previous (January 1, 1995) DRB estimate of 496 billion short tons.[19] The increase is attributable to updated coal resource data from the second phase of EIA's Coal Reserves Data Base (CRDB) project in Illinois (+ 15 billion short tons) and adjustments for the effects of resource depletion (– 3 billion short tons).

Not all the coal in the DRB is recoverable. EIA's latest estimates of the recoverable portions of the DRB indicate that about 54 percent of the national DRB estimate may be recovered by mining.

The DRB includes coal from States in all geographic regions. Nearly half the DRB is found in the Western Coal-Producing Region (Table 7). Coal resources believed to be minable by surface mining make up nearly one-third of the DRB, the major part of which (58 percent) occurs in the West. On the other hand, more than two-thirds of the DRB may be recoverable only by underground mining, and more than half of that amount (58 percent) is found in the Interior and Appalachian Coal-Producing Regions.

Coal rank is a measure of the degree of physical alteration, or "maturation" of the organic matter composing the coal. Coal ranks are related in a generalized way to coal heating values. Heat values increase from the lowest rank, lignite, toward the highest rank, anthracite, with the highest heat values found in the low-volatile

Table 6. Demonstrated Reserve Base of Coal in the United States, 1995, 1997
(Million Short Tons)

Area and Potential Method of Mining	Anthracite		Bituminous		Subbituminous		Lignite		Total	
	1997	1995	1997	1995	1997	1995	1997	1995	1997	1995
States East of the Mississippi	7,345.0	7,350.7	234,728.1	221,345.6	0.0	0.0	1,083.0	1,083.0	243,156.1	229,779.3
Underground Minable	3,975.0	3,975.9	188,964.0	175,553.2	0.0	0.0	0.0	0.0	192,939.0	179,529.1
Surface Minable	3,370.0	3,374.9	45,764.1	45,792.3	0.0	0.0	1,083.0	1,083.0	50,217.1	50,250.2
States West of the Mississippi	131.9	131.9	36,181.8	36,434.0	185,118.0	185,950.4	43,151.9	43,370.1	264,583.5	265,886.4
Underground Minable	116.4	116.4	27,337.1	27,518.1	121,382.6	121,388.8	0.0	0.0	148,836.1	149,023.3
Surface Minable	15.5	15.5	8,844.6	8,915.9	63,735.4	64,561.7	43,151.9	43,370.1	115,747.4	116,863.1
U.S. Total	**7,476.9**	**7,482.6**	**270,909.9**	**257,779.6**	**185,118.0**	**185,950.4**	**44,234.9**	**44,453.1**	**507,739.6**	**495,665.7**
Underground Minable	**4,091.4**	**4,092.3**	**216,301.1**	**203,071.3**	**121,382.6**	**121,388.8**	**0.0**	**0.0**	**341,775.2**	**328,552.4**
Surface Minable	**3,385.4**	**3,390.4**	**54,608.8**	**54,708.3**	**63,735.4**	**64,561.7**	**44,234.9**	**44,453.1**	**165,964.4**	**167,113.3**

Note: Totals based on available data. Totals may not equal sum of components because of independent rounding. Data are reported as of the first day of the year.

Sources: EIA Coal Reserves Data Base program, State geological and mineral resource surveys, and other geological reports.

[19] Energy Information Administration, *U.S. Coal Reserves: A Review and Update*, DOE/EIA-0529(95) (Washington, DC, August 1996), pp. 31-37.

Table 7. Demonstrated Reserve Base of Coal by State and Rank, 1995, 1997
(Million Short Tons)

Coal Producing State and Region	Anthracite		Bituminous		Subbituminous		Lignite		Total	
	1997	1995	1997	1995	1997	1995	1997	1995	1997	1995
Alabama	0.0	0.0	3,463.6	3,552.0	0.0	0.0	1,083.0	1,083.0	4,546.6	4,635.0
Alaska	0.0	0.0	697.5	697.5	5,414.4	5,418.4	14.0	14.0	6,125.9	6,129.9
Arizona	0.0	0.0	160.8	188.8	0.0	0.0	0.0	0.0	160.8	188.8
Arkansas	104.1	104.1	287.5	287.5	0.0	0.0	25.4	25.4	416.9	417.0
Colorado	25.5	25.5	8,710.9	8,776.6	3,829.6	3,851.8	4,189.9	4,189.9	16,755.9	16,843.8
Georgia	0.0	0.0	3.6	3.6	0.0	0.0	0.0	0.0	3.6	3.6
Idaho	0.0	0.0	4.4	4.4	0.0	0.0	0.0	0.0	4.4	4.4
Illinois	0.0	0.0	105,068.9	89,956.0	0.0	0.0	0.0	0.0	105,068.9	89,956.0
Indiana	0.0	0.0	9,916.5	9,991.0	0.0	0.0	0.0	0.0	9,916.5	9,991.0
Iowa	0.0	0.0	2,189.5	2,189.5	0.0	0.0	0.0	0.0	2,189.5	2,189.5
Kansas	0.0	0.0	975.0	975.6	0.0	0.0	0.0	0.0	975.0	975.6
Kentucky Total	0.0	0.0	32,040.6	32,564.7	0.0	0.0	0.0	0.0	32,040.6	32,564.7
Kentucky, Eastern	0.0	0.0	12,086.2	12,484.8	0.0	0.0	0.0	0.0	12,086.2	12,484.8
Kentucky, Western	0.0	0.0	19,954.4	20,079.8	0.0	0.0	0.0	0.0	19,954.4	20,079.8
Louisiana	0.0	0.0	0.0	0.0	0.0	0.0	462.7	471.3	462.7	471.3
Maryland	0.0	0.0	717.0	731.4	0.0	0.0	0.0	0.0	717.0	731.4
Michigan	0.0	0.0	127.7	127.7	0.0	0.0	0.0	0.0	127.7	127.7
Missouri	0.0	0.0	5,994.1	5,995.7	0.0	0.0	0.0	0.0	5,994.1	5,995.7
Montana	0.0	0.0	1,385.4	1,385.4	102,531.3	102,627.4	15,759.8	15,760.5	119,676.5	119,773.3
New Mexico	2.3	2.3	3,706.2	3,740.7	8,774.2	8,803.8	0.0	0.0	12,482.7	12,546.8
North Carolina	0.0	0.0	10.7	10.7	0.0	0.0	0.0	0.0	10.7	10.7
North Dakota	0.0	0.0	0.0	0.0	0.0	0.0	9,395.0	9,470.0	9,395.0	9,470.0
Ohio	0.0	0.0	23,663.9	23,754.0	0.0	0.0	0.0	0.0	23,663.9	23,754.0
Oklahoma	0.0	0.0	1,575.0	1,579.6	0.0	0.0	0.0	0.0	1,575.0	1,579.6
Oregon	0.0	0.0	0.0	0.0	17.5	17.5	0.0	0.0	17.5	17.5
Pennsylvania Total	7,219.5	7,225.2	21,426.6	21,642.6	0.0	0.0	0.0	0.0	28,646.1	28,867.8
Anthracite	7,219.5	7,225.2	0.0	0.0	0.0	0.0	0.0	0.0	7,219.5	7,225.2
Bituminous	0.0	0.0	21,426.6	21,642.6	0.0	0.0	0.0	0.0	21,426.6	21,642.6
South Dakota	0.0	0.0	0.0	0.0	0.0	0.0	366.1	366.1	366.1	366.1
Tennessee	0.0	0.0	815.7	827.1	0.0	0.0	0.0	0.0	815.7	827.1
Texas	0.0	0.0	0.0	0.0	0.0	0.0	12,931.0	13,064.9	12,931.0	13,064.9
Utah	0.0	0.0	5,849.3	5,954.6	1.1	1.1	0.0	0.0	5,850.4	5,955.7
Virginia	125.5	125.5	2,076.5	2,201.8	0.0	0.0	0.0	0.0	2,202.0	2,327.3
Washington	0.0	0.0	303.7	303.7	1,077.9	1,089.2	8.1	8.1	1,389.7	1,400.9
West Virginia	0.0	0.0	35,397.1	35,983.1	0.0	0.0	0.0	0.0	35,397.1	35,983.1
Wyoming	0.0	0.0	4,342.5	4,354.4	63,471.9	64,141.4	0.0	0.0	67,814.5	68,495.8
Appalachian Total[1]	**7,345.0**	**7,350.7**	**99,660.8**	**101,191.1**	**0.0**	**0.0**	**1,083.0**	**1,083.0**	**108,088.8**	**109,624.8**
Interior Total[1]	**104.1**	**104.1**	**146,088.3**	**131,182.3**	**0.0**	**0.0**	**13,419.0**	**13,561.6**	**159,611.4**	**144,848.0**
Western Total[1]	**27.8**	**27.8**	**25,160.8**	**25,406.2**	**185,118.0**	**185,950.4**	**29,732.8**	**29,808.5**	**240,039.5**	**241,193.0**
East of the Mississippi	**7,345.0**	**7,350.7**	**234,728.1**	**221,345.6**	**0.0**	**0.0**	**1,083.0**	**1,083.0**	**243,156.1**	**229,779.3**
West of the Mississippi	**131.9**	**131.9**	**36,181.8**	**36,434.0**	**185,118.0**	**185,950.4**	**43,151.9**	**43,370.1**	**264,583.5**	**265,886.4**
U.S. Total	**7,476.9**	**7,482.6**	**270,909.9**	**257,779.6**	**185,118.0**	**185,950.4**	**44,234.9**	**44,453.1**	**507,739.7**	**495,665.7**

[1]For a definition of coal-producing regions, see Table 13.

Note: Totals based on available data. Totals may not equal sum of components because of independent rounding. Data are reported as of the first day of the year.

Sources: EIA Coal Reserves Data Base program, State geological and mineral resource surveys, and other geological reports.

bituminous coals, just below anthracite in rank. Fifty-three percent of the DRB is comprised of bituminous coals, which are found primarily in the Interior and Appalachian Regions. Subbituminous coals account for more than 36 percent of the total and is all located in the Western States. Lignite makes up less than 9 percent of the DRB, primarily located in the West. Anthracite represents only 1.5 percent of the DRB and almost all of it is located in northeastern Pennsylvania.

DRB summary data by State, coal rank, and potential mining method are presented in Tables 7 through 10, along with the previous (January 1, 1995) DRB for comparison. With the exception of Illinois, the 1997 DRB is based on the same data sources used for the previous DRB. All data are updated to the current base year to account for the estimated effects of resource depletion due to mining and coal lost in the mining process.

The sulfur content of the coal in the DRB has been estimated by EIA according to six ranges of pounds of sulfur per million Btu and five ranges of heat value, in millions of Btu per short ton (Table A1). For more general discussion, however, EIA refers to three major sulfur ranges: low, medium, and high (Table 11). Although no single sulfur range prevails for coal in the United States, there is more high-sulfur coal currently in the DRB than any other range (Table 12). High-sulfur coal makes up 196.9 billion short tons, or 39 percent of all coal included in the DRB. Medium-sulfur coal totals 140.9 billion short tons, or 28 percent of the DRB, and low-sulfur coal amounts to 169.9 billion short tons, or 33 percent.

When examined at the regional level, the distribution of sulfur ranges in coal is much less equally divided. Most of the low-sulfur coal included in the DRB (84 percent) is in the West. Appalachia encompasses 15 percent of the low-sulfur DRB and the Interior only 1 percent (2 billion short tons of low-sulfur resources), located entirely in Illinois, Oklahoma, and Indiana. Similarly, an estimated 87 billion short tons (61 percent) of the medium-sulfur DRB coal is in the West, about 27 percent of the total is estimated to be in Appalachia, and only 13 percent is in the Interior Region. Most of the high-sulfur DRB is in the Interior Region. EIA estimates that the Interior contains nearly 71 percent of the total high-sulfur DRB coal in the United States; Appalachia, less than 23 percent; and the West, 6 percent.

In regard to overall quantities of coal, the smallest share now belongs to the Appalachian Region, with 108 billion short tons, or 21 percent of the DRB. Coal resources in this region are almost entirely bituminous. Low-sulfur coal accounts for 24 percent of the region's DRB, medium-sulfur coal for nearly 35 percent, and high-sulfur coal for more than 41 percent. Low-sulfur coal in Appalachia is concentrated in eastern Kentucky, Virginia, southern West Virginia, and in the Pennsylvania anthracite field.

The Interior Region is estimated to contain 159.6 billion short tons, or 31 percent of the DRB of U.S. coal. All of the DRB coal in the region is bituminous, except for 13.4 billion short tons of lignite deposits, primarily in Texas, and 0.1 billion short tons of anthracite in Arkansas (Table 7). More than 87 percent of the region's DRB is high-sulfur coal and only 1 percent is low-sulfur coal.

In the Western Region, the DRB is estimated at 240.0 billion short tons, which is 47 percent of the U.S. total. Subbituminous coal is most prevalent in the West, where it constitutes 77 percent of the Region's DRB, with the vast majority occurring in Montana and Wyoming (Table 7). Lignite makes up more than 12 percent of the DRB in the West, primarily in the Fort Union-age geologic deposits of Montana and North Dakota and the relatively young, Tertiary-age Gulf Coast deposits of Texas. The remainder, more than 10 percent of the Western DRB, is bituminous coal, found mostly in Colorado, Utah, and Wyoming, plus small areas of anthracite in several scattered locations. The EIA estimates that 59 percent of the DRB coal in the West is low-sulfur, that 36 percent is medium-sulfur, and that 5 percent is high-sulfur (Table 12).

Accessible Resources

Although the 508 billion short tons of coal in the DRB is 477 times the Nation's coal production in 1996, almost half of the DRB is not expected to be recovered. First, more than 17 percent of the DRB is estimated as presently inaccessible for mining. Then, of the accessible portion of the DRB, EIA estimates that only 66 percent can actually be recovered by mining, with the other 34 percent likely to be lost in the mining process, based on recent mining experience. The result is that only a net 54 percent of the DRB is believed to be recoverable.

The EIA no longer publishes the detailed accessible reserve base table, that is, the tonnages of the DRB that are estimated as accessible for future mining. The accessibility factors are summarized in Table 13 in the net accessibility factors compiled or estimated for each coal supply region. Note that the accessibility factors reported in Table 13 are the converse of the "inaccessible resource factors" listed in earlier versions of this report.

Table 8. Demonstrated Reserve Base of Coal by State and Potential Method of Mining, 1995, 1997
(Million Short Tons)

Coal Producing State and Region	Underground		Surface		Total	
	1997	1995	1997	1995	1997	1995
Alabama	1,290.2	1,361.9	3,256.3	3,273.1	4,546.6	4,635.0
Alaska	5,423.0	5,423.0	703.0	706.9	6,125.9	6,129.9
Arizona	101.6	101.6	59.3	87.3	160.8	188.8
Arkansas	272.5	272.5	144.4	144.5	416.9	417.0
Colorado	11,978.5	12,049.1	4,777.4	4,794.7	16,755.9	16,843.8
Georgia	1.9	1.9	1.7	1.7	3.6	3.6
Idaho	4.4	4.4	0.0	0.0	4.4	4.4
Illinois	88,460.5	73,781.3	16,608.4	16,174.7	105,068.9	89,956.0
Indiana	8,859.8	8,872.8	1,056.7	1,118.1	9,916.5	9,991.0
Iowa	1,732.5	1,732.5	457.0	457.0	2,189.5	2,189.5
Kansas	0.0	0.0	975.0	975.6	975.0	975.6
Kentucky Total	18,507.8	18,884.8	13,532.8	13,679.8	32,040.6	32,564.7
Kentucky, Eastern	2,246.9	2,525.0	9,839.3	9,959.9	12,086.2	12,484.8
Kentucky, Western	16,260.9	16,359.9	3,693.5	3,720.0	19,954.4	20,079.8
Louisiana	0.0	0.0	462.7	471.3	462.7	471.3
Maryland	636.8	649.2	80.2	82.2	717.0	731.4
Michigan	123.1	123.1	4.6	4.6	127.7	127.7
Missouri	1,479.1	1,479.1	4,514.9	4,516.5	5,994.1	5,995.7
Montana	70,958.4	70,958.7	48,718.2	48,814.6	119,676.5	119,773.3
New Mexico	6,204.1	6,205.4	6,278.6	6,341.4	12,482.7	12,546.8
North Carolina	10.7	10.7	0.0	0.0	10.7	10.7
North Dakota	0.0	0.0	9,395.0	9,470.0	9,395.0	9,470.0
Ohio	17,788.7	17,846.7	5,875.2	5,907.3	23,663.9	23,754.0
Oklahoma	1,237.0	1,237.4	338.0	342.2	1,575.0	1,579.6
Oregon	14.5	14.5	2.9	2.9	17.5	17.5
Pennsylvania Total	24,231.7	24,408.2	4,414.4	4,459.6	28,646.1	28,867.8
Anthracite	3,849.5	3,850.4	3,370.0	3,374.9	7,219.5	7,225.2
Bituminous	20,382.2	20,557.9	1,044.4	1,084.7	21,426.6	21,642.6
South Dakota	0.0	0.0	366.1	366.1	366.1	366.1
Tennessee	531.5	539.0	284.3	288.2	815.7	827.1
Texas	0.0	0.0	12,931.0	13,064.9	12,931.0	13,064.9
Utah	5,582.5	5,687.8	267.9	267.9	5,850.4	5,955.7
Virginia	1,528.2	1,630.0	673.8	697.3	2,202.0	2,327.3
Washington	1,332.3	1,332.3	57.4	68.7	1,389.7	1,400.9
West Virginia	30,968.3	31,419.5	4,428.8	4,563.6	35,397.1	35,983.1
Wyoming	42,515.8	42,525.1	25,298.7	25,970.7	67,814.5	68,495.8
Appalachian Total[1]	**79,234.7**	**80,392.0**	**28,854.0**	**29,232.8**	**108,088.8**	**109,624.8**
Interior Total[1]	**118,425.4**	**103,858.6**	**41,186.0**	**40,989.4**	**159,611.4**	**144,848.0**
Western Total[1]	**144,115.0**	**144,301.8**	**95,924.5**	**96,891.1**	**240,039.5**	**241,193.0**
East of the Mississippi	**192,939.0**	**179,529.1**	**50,217.1**	**50,250.2**	**243,156.1**	**229,779.3**
West of the Mississippi	**148,836.1**	**149,023.3**	**115,747.4**	**116,863.1**	**264,583.5**	**265,886.4**
U.S. Total	**341,775.1**	**328,552.4**	**165,964.5**	**167,113.3**	**507,739.6**	**495,665.7**

[1]For a definition of coal-producing regions, see Table 13.

Note: Totals based on available data. Totals may not equal sum of components because of independent rounding. Data are reported as of the first day of the year.

Sources: EIA Coal Reserves Data Base program, State geological and mineral resource surveys, and other geological reports.

Table 9. Demonstrated Reserve Base of Coal by State and Rank, Potentially Minable by Underground Methods, 1995, 1997

(Million Short Tons)

Coal Producing State and Region	Anthracite		Bituminous		Subbituminous		Lignite		Total	
	1997	1995	1997	1995	1997	1995	1997	1995	1997	1995
Alabama	0.0	0.0	1,290.2	1,361.9	0.0	0.0	0.0	0.0	1,290.2	1,361.9
Alaska	0.0	0.0	617.0	617.0	4,805.9	4,805.9	0.0	0.0	5,423.0	5,423.0
Arizona	0.0	0.0	101.6	101.6	0.0	0.0	0.0	0.0	101.6	101.6
Arkansas	88.6	88.6	183.9	183.9	0.0	0.0	0.0	0.0	272.5	272.5
Colorado	25.5	25.5	8,123.4	8,188.1	3,829.6	3,835.5	0.0	0.0	11,978.5	12,049.1
Georgia	0.0	0.0	1.9	1.9	0.0	0.0	0.0	0.0	1.9	1.9
Idaho	0.0	0.0	4.4	4.4	0.0	0.0	0.0	0.0	4.4	4.4
Illinois	0.0	0.0	88,460.5	73,781.3	0.0	0.0	0.0	0.0	88,460.5	73,781.3
Indiana	0.0	0.0	8,859.8	8,872.8	0.0	0.0	0.0	0.0	8,859.8	8,872.8
Iowa	0.0	0.0	1,732.5	1,732.5	0.0	0.0	0.0	0.0	1,732.5	1,732.5
Kentucky Total	0.0	0.0	18,507.8	18,884.8	0.0	0.0	0.0	0.0	18,507.8	18,884.8
Kentucky, Eastern	0.0	0.0	2,246.9	2,525.0	0.0	0.0	0.0	0.0	2,246.9	2,525.0
Kentucky, Western	0.0	0.0	16,260.9	16,359.9	0.0	0.0	0.0	0.0	16,260.9	16,359.9
Maryland	0.0	0.0	636.8	649.2	0.0	0.0	0.0	0.0	636.8	649.2
Michigan	0.0	0.0	123.1	123.1	0.0	0.0	0.0	0.0	123.1	123.1
Missouri	0.0	0.0	1,479.1	1,479.1	0.0	0.0	0.0	0.0	1,479.1	1,479.1
Montana	0.0	0.0	1,385.4	1,385.4	69,573.0	69,573.3	0.0	0.0	70,958.4	70,958.7
New Mexico	2.3	2.3	2,735.0	2,736.3	3,466.8	3,466.8	0.0	0.0	6,204.1	6,205.4
North Carolina	0.0	0.0	10.7	10.7	0.0	0.0	0.0	0.0	10.7	10.7
Ohio	0.0	0.0	17,788.7	17,846.7	0.0	0.0	0.0	0.0	17,788.7	17,846.7
Oklahoma	0.0	0.0	1,237.0	1,237.4	0.0	0.0	0.0	0.0	1,237.0	1,237.4
Oregon	0.0	0.0	0.0	0.0	14.5	14.5	0.0	0.0	14.5	14.5
Pennsylvania Total	3,849.5	3,850.4	20,382.2	20,557.9	0.0	0.0	0.0	0.0	24,231.7	24,408.2
Anthracite	3,849.5	3,850.4	0.0	0.0	0.0	0.0	0.0	0.0	3,849.5	3,850.4
Bituminous	0.0	0.0	20,382.2	20,557.9	0.0	0.0	0.0	0.0	20,382.2	20,557.9
Tennessee	0.0	0.0	531.5	539.0	0.0	0.0	0.0	0.0	531.5	539.0
Utah	0.0	0.0	5,581.4	5,686.7	1.1	1.1	0.0	0.0	5,582.5	5,687.8
Virginia	125.5	125.5	1,402.7	1,504.6	0.0	0.0	0.0	0.0	1,528.2	1,630.0
Washington	0.0	0.0	303.7	303.7	1,028.6	1,028.6	0.0	0.0	1,332.3	1,332.3
West Virginia	0.0	0.0	30,968.3	31,419.5	0.0	0.0	0.0	0.0	30,968.3	31,419.5
Wyoming	0.0	0.0	3,852.7	3,862.0	38,663.1	38,663.1	0.0	0.0	42,515.8	42,525.1
Appalachian Total[1]	**3,975.0**	**3,975.9**	**75,259.7**	**76,416.1**	**0.0**	**0.0**	**0.0**	**0.0**	**79,234.8**	**80,392.0**
Interior Total[1]	**88.6**	**88.6 1**	**118,336.8**	**103,770.0**	**0.0**	**0.0**	**0.0**	**0.0**	**118,425.4**	**103,858.6**
Western Total[1]	**27.8**	**27.8**	**22,704.6**	**22,885.2**	**121,382.6**	**121,388.8**	**0.0**	**0.0**	**144,115.0**	**144,301.8**
East of the Mississippi	**3,975.0**	**3,975.9 1**	**88,964.0**	**175,553.2**	**0.0**	**0.0**	**0.0**	**0.0**	**192,939.0**	**179,529.1**
West of the Mississippi	**116.4**	**116.4**	**27,337.1**	**27,518.1**	**121,382.6**	**121,388.8**	**0.0**	**0.0**	**148,836.1**	**149,023.3**
U.S. Total	**4,091.4**	**4,092.3 2**	**216,301.1**	**203,071.3**	**121,382.6**	**121,388.8**	**0.0**	**0.0**	**341,775.2**	**328,552.4**

[1] For a definition of coal-producing regions, see Table 13.

Note: Totals based on available data. Totals may not equal sum of components because of independent rounding. Data are reported as of the first day of the year.

Sources: EIA Coal Reserves Data Base program, State geological and mineral resource surveys, and other geological reports.

Table 10. Demonstrated Reserve Base of Coal by State and Rank, Potentially Minable by Surface Methods, 1995, 1997

(Million Short Tons)

Coal Producing State and Region	Anthracite		Bituminous		Subbituminous		Lignite		Total	
	1997	1995	1997	1995	1997	1995	1997	1995	1997	1995
Alabama	-	0.0	2,173.3	2,190.1	0.0	0.0	1,083.0	1,083.0	3,256.3	3,273.1
Alaska	0.0	0.0	80.5	80.5	608.5	612.4	14.0	14.0	703.0	706.9
Arizona	0.0	0.0	59.3	87.3	0.0	0.0	0.0	0.0	59.3	87.3
Arkansas	15.5	15.5	103.6	103.6	0.0	0.0	25.4	25.4	144.4	144.5
Colorado	0.0	0.0	587.6	588.5	0.0	16.3	4,189.9	4,189.9	4,777.4	4,794.7
Georgia	0.0	0.0	1.7	1.7	0.0	0.0	0.0	0.0	1.7	1.7
Illinois	0.0	0.0	16,608.4	16,174.7	0.0	0.0	0.0	0.0	16,608.4	16,174.7
Indiana	0.0	0.0	1,056.7	1,118.1	0.0	0.0	0.0	0.0	1,056.7	1,118.1
Iowa	0.0	0.0	457.0	457.0	0.0	0.0	0.0	0.0	457.0	457.0
Kansas	0.0	0.0	975.0	975.6	0.0	0.0	0.0	0.0	975.0	975.6
Kentucky Total	0.0	0.0	13,532.8	13,679.8	0.0	0.0	0.0	0.0	13,532.8	13,679.8
Kentucky, Eastern	0.0	0.0	9,839.3	9,959.9	0.0	0.0	0.0	0.0	9,839.3	9,959.9
Kentucky, Western	0.0	0.0	3,693.5	3,720.0	0.0	0.0	0.0	0.0	3,693.5	3,720.0
Louisiana	0.0	0.0	0.0	0.0	0.0	0.0	462.7	471.3	462.7	471.3
Maryland	0.0	0.0	80.2	82.2	0.0	0.0	0.0	0.0	80.2	82.2
Michigan	0.0	0.0	4.6	4.6	0.0	0.0	0.0	0.0	4.6	4.6
Missouri	0.0	0.0	4,514.9	4,516.5	0.0	0.0	0.0	0.0	4,514.9	4,516.5
Montana	0.0	0.0	0.0	0.0	32,958.3	33,054.1	15,759.8	15,760.5	48,718.2	48,814.6
New Mexico	0.0	0.0	971.1	1,004.4	5,307.4	5,337.0	0.0	0.0	6,278.6	6,341.4
North Dakota	0.0	0.0	0.0	0.0	0.0	0.0	9,395.0	9,470.0	9,395.0	9,470.0
Ohio	0.0	0.0	5,875.2	5,907.3	0.0	0.0	0.0	0.0	5,875.2	5,907.3
Oklahoma	0.0	0.0	338.0	342.2	0.0	0.0	0.0	0.0	338.0	342.2
Oregon	0.0	0.0	0.0	0.0	2.9	2.9	0.0	0.0	2.9	2.9
Pennsylvania Total	3,370.0	3,374.9	1,044.4	1,084.7	0.0	0.0	0.0	0.0	4,414.4	4,459.6
Anthracite	3,370.0	3,374.9	0.0	0.0	0.0	0.0	0.0	0.0	3,370.0	3,374.9
Bituminous	0.0	0.0	1,044.4	1,084.7	0.0	0.0	0.0	0.0	1,044.4	1,084.7
South Dakota	0.0	0.0	0.0	0.0	0.0	0.0	366.1	366.1	366.1	366.1
Tennessee	0.0	0.0	284.3	288.2	0.0	0.0	0.0	0.0	284.3	288.2
Texas	0.0	0.0	0.0	0.0	0.0	0.0	12,931.0	13,064.9	12,931.0	13,064.9
Utah	0.0	0.0	267.9	267.9	0.0	0.0	0.0	0.0	267.9	267.9
Virginia	0.0	0.0	673.8	697.3	0.0	0.0	0.0	0.0	673.8	697.3
Washington	0.0	0.0	0.0	0.0	49.3	60.6	8.1	8.1	57.4	68.7
West Virginia	0.0	0.0	4,428.8	4,563.6	0.0	0.0	0.0	0.0	4,428.8	4,563.6
Wyoming	0.0	0.0	489.8	492.4	24,808.8	25,478.3	0.0	0.0	25,298.7	25,970.7
Appalachian Total[1]	**3,370.0**	**3,374.9**	**24,401.1**	**24,775.0**	**0.0**	**0.0**	**1,083.0**	**1,083.0**	**28,854.0**	**29,232.8**
Interior Total[1]	**15.5**	**15.5**	**27,751.5**	**27,412.3**	**0.0**	**0.0**	**13,419.0**	**13,561.6**	**41,186.0**	**40,989.4**
Western Total[1]	**0.0**	**0.0**	**2,456.2**	**2,521.0**	**63,735.4**	**64,561.7**	**29,732.8**	**29,808.5**	**95,924.5**	**96,891.1**
East of the Mississippi	**3,370.0**	**3,374.9**	**45,764.1**	**45,792.3**	**0.0**	**0.0**	**1,083.0**	**1,083.0**	**50,217.1**	**50,250.2**
West of the Mississippi	**15.5**	**15.5**	**8,844.6**	**8,915.9**	**63,735.4**	**64,561.7**	**43,151.9**	**43,370.1**	**115,747.4**	**116,863.1**
U.S. Total	**3,385.4**	**3,390.4**	**54,608.8**	**54,708.3**	**63,735.4**	**64,561.7**	**44,234.9**	**44,453.1**	**165,964.4**	**167,113.3**

[1] For a definition of coal-producing regions, see Table 13.

Note: Totals based on available data. Totals may not equal sum of components because of independent rounding. Data are reported as of the first day of the year.

Sources: EIA Coal Reserves Data Base program, State geological and mineral resource surveys, and other geological reports.

Table 11. EIA Sulfur Content Categories for Coal

Qualitative Rating	Pounds of Sulfur per Million Btu[a]	Approximate Range of Sulfur Content (percent)[b]		Approximate Correlation with Sulfur Criteria for Coal
		High-Grade Bituminous	High-Grade Lignite	
Low Sulfur	≤ 0.40	≤ 0.5	≤ 0.3	Exceeds 1971 NSPS Requirements[b]
	0.41-0.60	0.5–0.8	0.3–0.5	Meets 1971 NSPS Requirements[b]
Medium Sulfur . .	0.61-0.83	0.8–1.1	0.5–0.6	Fails 1971 NSPS; marginally low-sulfur coal, may meet 1971 NSPS when blended
	0.84-1.67	1.1–2.2	0.6–1.3	Fails 1971 NSPS; would require use of emission reduction technologies on new-source boilers
High Sulfur	1.68-2.50	2.2–3.3	1.3–1.9	Coals used primarily in pre-regulation boilers, such as units affected by Phase I of CAAA90. Units using high-sulfur coals either have or will install scrubbers, may be able to offset emissions with allowances, or may be operated at reduced capacity and/or eventually replaced.
	> 2.50	> 3.3	> 1.9	

[a]As-received basis.

[b]Percent sulfur content by weight, as-received basis.

Notes: **NSPS Requirements** refers to New Source Performance Standards authorized under the Clean Air Act Amendments of 1970 and issued in **1971** by the Environmental Protection Agency (EPA). NSPS affected new or modified electric utility units of more than 73 megawatts capacity and required that average emissions not exceed 1.2 pounds of SO_2 per million Btu of heat input. To ensure compliance, the NSPS relied on "command and control" regulations, which specified abatement technologies and imposed fines and penalties. In 1979, the EPA issued **Revised NSPS**, required under the Clean Air Act Amendments of 1977. The revised standards applied more broadly and imposed additional mitigation requirements on new source utility plants, but 1.2 pounds of SO_2 per million Btu remained as the key criterion for coal. This "compliance coal" standard is still in effect, although it has been eclipsed somewhat by the CAAA90, which established more flexible, market-based compliance mechanisms.

CAAA90 refers to the Clean Air Act Amendments of 1990, under which EPA set up a market to trade in emission "allowances," one for each ton of SO_2. Under CAAA90, a national limit of 8.95 million allowances will take effect in 2000 for annual SO_2 emissions from existing and future electric utility units of more than 25 megawatts. Utilities may choose to meet national limits by buying allowances; by reducing emissions through fuel switching, coal cleaning, flue gas desulfurization (scrubbing), or advanced utilization technologies; and by offsetting high-emission units via increased use of low-emission units or purchase of unused allowances from utilities that have reduced their SO_2 emissions. **Phase I** (1995-1999) is the period by which 261 units, identified in CAAA90 as the largest electric utility sources of SO_2 and nitrous oxide emissions, were required to meet interim emission levels. The 261 are older units that previously had not been required to reduce SO_2 output. **Phase II**, beginning in 2000, will further tighten annual emission limits for the 261 units as well as set restrictions for virtually all new units, both utility and nonutility, of 25 megawatts or greater.

Source: Energy Information Administration, *Acid Rain Compliance Strategies for the Clean Air Act Amendments of 1990,* DOE/EIA-0582 (Washington, DC, March 1994), pp. ix-3.

Accessibility factors represent the fraction of the DRB—surface or underground—that is presently considered accessible for future development. They are usually determined by measuring or estimating the areas or tonnages of *inaccessible* coal resources in a study area.

Accessibility adjustments are also recognized as a useful intermediate level at which to make and document internal adjustments that account for variations from standard DRB criteria due to local mining practice. (For example, in Chapter 2, the exclusion of 42-inch or thinner beds from underground mining in Illinois.) EIA's accessibility factors are closely comparable with U.S. Geological Survey (USGS) Coal Availability Study data.

Estimated Recoverable Reserves

Recovery factors (Table 13) follow the same format as accessibility factors and are based on recent coal

Table 12. Demonstrated Reserve Base of Coal in the United States by Sulfur Range and Coal-Producing Region
(Million Short Tons Remaining as of January 1, 1997)

Coal-Producing Region	Summary Sulfur Content Categories[a] (Pounds of Sulfur per Million Btu)							
	Low Sulfur (≤ 0.60)		Medium Sulfur (0.61-1.67)		High Sulfur (≥ 1.68)		Total	
	Million Short Tons	Percent of Total	Million Short Tons	Percent of Total	Million Short Tons	Percent of Total	Million Short Tons	Percent of Total
Surface								
Appalachia	9,261.62	(15.6%)	11,352.96	(19.4%)	8,239.42	(17.1%)	28,853.99	(17.4%)
Interior	197.91	(0.3%)	9,511.24	(16.2%)	31,476.83	(65.5%)	41,185.98	(24.8%)
West	49,814.32	(84.0%)	37,772.15	(64.4%)	8,337.98	(17.4%)	95,924.45	(57.8%)
U.S. Total	**59,273.85**	**(100.0%)**	**58,636.36**	**(100.0%)**	**48,054.22**	**(100.0%)**	**165,964.43**	**(100.0%)**
Underground								
Appalachia	16,607.81	(15.0%)	26,038.79	(31.6%)	36,588.17	(24.6%)	79,234.78	(23.2%)
Interior	1,862.67	(1.7%)	8,349.47	(10.1%)	108,213.30	(72.7%)	118,425.43	(34.7%)
West	92,152.75	(83.3%)	47,909.26	(58.2%)	4,053.00	(2.7%)	144,115.01	(42.2%)
U.S. Total	**110,623.23**	**(100.0%)**	**82,297.52**	**(100.0%)**	**148,854.47**	**(100.0%)**	**341,775.22**	**(100.0%)**
Total								
Appalachia	25,869.43	(15.2%)	37,391.75	(26.50%)	44,827.59	(22.8%)	108,088.77	(21.3%)
Interior	2,060.58	(1.2%)	17,860.71	(12.70%)	44,827.59	(70.9%)	159,611.42	(31.4%)
West	141,967.07	(83.6%)	85,681.42	(60.80%)	12,390.12	(6.3%)	240,039.47	(47.3%)
U.S. Total	**169,897.08**	**(100.0%)**	**140,933.88**	**(100.00%)**	**196,908.69**	**(100.0%)**	**507,739.65**	**(100.0%)**

[a]For detailed analyses, the EIA uses six sulfur content ranges. For general discussion and summary data, however, those six ranges are combined into the three qualitative ratings of coal presented here (low-, medium-, and high-sulfur content).

Notes: Coal supply regions that comprise each coal-producing region above are listed in Table 17. Data may not equal sum of components due to independent rounding.

Source: EIA Coal Reserves Data Base program, State geological and mineral resource surveys, and other geological reports.

recovery rates for coal mining reported to EIA by mine operators. These may be supplemented by coal field interviews and observations.

The estimated recoverable reserves of coal in the United States(Table B2) represent the estimated portion of the DRB, allocated by Btu and sulfur ranges, that can be recovered by standard mining technologies, assuming a market and an adequate selling price at the time of mining. These reserves are summarized by low-, medium-, and high-sulfur levels in Table 14.

The 1997 estimated recoverable reserves are 1.2 billion short tons larger than estimated for 1995. The 1995 estimated recoverable reserves, in turn, had increased by 9.2 billion short tons, or 3.4 percent, over the previous recoverable reserve estimates, for 1992.[20] At 36 percent, low-sulfur estimated recoverable reserves make up the largest part of the total. Medium-sulfur reserves account for 31 percent and high-sulfur reserves for 33 percent.

Based on current mining trends, however, much of the 64 percent of recoverable coal reserves containing medium and high sulfur levels may not soon be mined because of unfavorable quality, prices, mining costs, location, and/or transportation infrastructure.

Although the summary data in Tables 12 and 14 are both derived from the DRB database, differences in the characteristics of the mines and coal types in the three regions cause differences in data distribution. For example, the surface-minable DRB in Appalachia constitutes 17 percent of the DRB of the United States but only 13 percent of the estimated recoverable reserves,

[20] Energy Information Administration, *U.S. Coal Reserves: An Update by Heat and Sulfur Content*, DOE/EIA-0529(92) (Washington, DC, February 1993) p. 24.

Table 13. Net Accessibility and Recovery Factors for Coal Resources, by Coal-Producing Region

Coal-Producing Region State	Accessibility Factor		Recovery Factor	
	Surface	Underground	Surface	Underground
Appalachia				
Alabama	83	90	86	56
Georgia	85	90	80	50
Kentucky, Eastern	71	91	79	62
Maryland	85	90	80	61
North Carolina	85	90	80	50
Ohio	82	88	80	50
Pennsylvania, Anthracite	14	18	90	50
Pennsylvania, Bituminous	85	90	82	59
Tennessee	85	90	80	61
Virginia	80	90	80	62
West Virginia, Northern	75	90	79	59
West Virginia, Southern	82	90	79	59
Interior				
Arkansas	85	90	82	52
Illinois	80	64	76	50
Indiana	71	80	82	52
Iowa	85	90	82	52
Kansas	85	90	82	60
Kentucky, Western	75	80	83	53
Louisiana	90	90	82	60
Michigan	85	90	80	50
Missouri	85	90	82	52
Oklahoma	85	90	82	52
Texas	90	90	86	60
Western				
Alaska, Northern	50	50	00	00
Alaska, Southern	90	90	88	56
Arizona	90	90	88	56
Colorado	89	90	88	58
Idaho	86	90	80	50
Montana, Eastern	86	90	91	56
Montana, Western	90	90	91	56
New Mexico	90	90	88	56
North Dakota	85	90	90	50
Oregon	90	90	80	50
South Dakota	84	90	90	60
Utah	90	90	88	54
Washington	90	90	88	56
Wyoming	98	90	89	60

Sources: Energy Information Administration, *Estimation of U.S. Coal Reserves by Coal Type: Heat and Sulfur Content*, 1987 data (1989); also Coal Reserves Data Base Program, Office of Coal, Nuclear, Electric and Alternate Fuels (1998) and Form EIA-7A, "Coal Production Report" (1992-1996).

Table 14. Estimated Recoverable Reserves of Coal in the United States by Sulfur Range and Major Region
(Remaining as of January 1, 1997)

Coal-Producing Region	Summary Sulfur Content Categories[a] (Pounds of Sulfur per Million Btu)							
	Low Sulfur (≤ 0.60)		Medium Sulfur (0.61-1.67)		High Sulfur (≥ 1.68)		Total	
	Million Short Tons	Percent of Total	Million Short Tons	Percent of Total	Million Short Tons	Percent of Total	Million Short Tons	Percent of Total
Surface								
Appalachia	4,311.5	(9.5%)	6,785.9	(15.5%)	5,186.3	(16.0%)	16,283.6	(13.4%)
Interior	126.7	(0.3%)	7,164.1	(16.4%)	20,544.2	(63.4%)	27,835.1	(22.9%)
West	40,963.3	(90.2%)	29,801.5	(68.1%)	6,686.2	(20.6%)	77,451.0	(63.7%)
U.S. Total	**45,401.5**	**(100.0%)**	**43,751.6**	**(100.0%)**	**32,416.6**	**(100.0%)**	**121,569.7**	**(100.0%)**
Underground								
Appalachia	7,363.5	(13.4%)	13,550.8	(32.9%)	18,096.7	(31.4%)	39,011.0	(25.4%)
Interior	642.1	(1.2%)	2,877.1	(7.0%)	37,421.3	(65.0%)	40,940.5	(26.7%)
West	46,812.1	(85.4%)	24,727.3	(60.1%)	2,082.0	(3.6%)	73,621.4	(47.9%)
U.S. Total	**54,817.7**	**(100.0%)**	**41,155.2**	**(100.0%)**	**57,600.0**	**(100.0%)**	**153,572.9**	**(100.0%)**
Total								
Appalachia	11,675.0	(11.6%)	20,336.7	(24.0%)	23,283.0	(25.9%)	55,294.7	(20.1%)
Interior	768.8	(0.8%)	10,041.2	(11.8%)	57,965.5	(64.4%)	68,775.5	(25.0%)
West	87,775.4	(87.6%)	54,528.8	(64.2%)	8,768.2	(9.7%)	151,072.4	(54.9%)
U.S. Total	**100,219.2**	**(100.0%)**	**84,906.8**	**(100.0%)**	**90,016.7**	**(100.0%)**	**275,142.6**	**(100.0%)**

[a]For detailed analyses, the EIA uses six sulfur content ranges. For general discussion and summary data, however, those six ranges are combined into the three qualitative ratings of coal presented here (low-, medium-, and high-sulfur content).

Notes: Coal supply regions that comprise each coal-producing region above are listed in Table 17. Data may not equal sum of components due to independent rounding.

Source: EIA Coal Reserves Data Base program, State geological and mineral resource surveys, and other geological reports.

while in the West the surface-minable DRB is 58 percent of the national DRB but makes up a higher portion—64 percent—of the estimated U.S. recoverable reserves. The differences between DRB and recoverable reserve portions reflect the higher accessibility and recovery rates achievable in the West.

Further, in Appalachia, the surface accessibility factors average only 70 percent—lower than in the West because of more land use constraints and physical minability restrictions. Also, Appalachian accessibility is skewed by the extremely low rate of accessibility in the Pennsylvania anhracite region (14 percent). With that region excluded, the surface accessibility factor would rise to 77 percent. Surface accessibility in eastern Kentucky at 71 percent is also well below the regional average. This low percentage reflects the fact that in eastern Kentucky many of the thin coalbeds in the surface-minable DRB are mined only selectively.[21] The DRB is considered to be inaccessible for thin coalbeds in eastern Kentucky in districts and thicknesses currently not commercially minable.

Finally, the surface mining rates of recovery are kept lower in Appalachia by the need to mine in thinner beds and (to varying degrees) in more difficult topography, in more indurated overburdens, and with more frequent groundwater and surface water concerns than in the major Western coal supply areas. Appalachian recovery rates average about 81 percent for the coal resources considered accessible.

[21] As the results of more USGS Coal Availability Studies become available and, in general, as more up-to-date accessibility estimates are made, it is likely that additional instances of diminished accessibility to coal resources will be determined in Appalachia.

In the West, surface accessibility factors average 91 percent. They are relatively high primarily because of fewer land use constraints and fewer known physical minability restrictions than in the East. The Geological Survey of Wyoming estimated that 98 percent of the DRB in that State may be accessible. Only in northern Alaska has EIA estimated a low rate of accessibility (50 percent), because of the difficulties of mining in tundra and permafrost and the absence of relevant experience mining under those conditions in the United States.

Surface recovery rates in the West are also high, averaging 90 percent for accessible coal resources. Many of the most productive mines recover thick coalbeds (40 to 100 feet are not uncommon), with relatively thin overburden, developed in soft types of rock or unconsolidated sediments. Even in harder rock, where more blasting is required, the overburden ratios tend to be low and the mechanical loading of the thicker coalbeds efficient. Net recovery rates in Western coals may also tend to be higher in areas such as New Mexico and Washington, where the coal contains thin partings of shale that cannot be avoided by mining equipment. These rock contaminants are mined through, raising the mined tonnage reported and the apparent rate of recovery, as the coal is generally not washed. These coals are accepted for combustion at nearby mine mouth power plants with 20 percent or more ash-forming material and lower heat value than if they were cleaned, but with minimal transportation costs. The reported rates of recovery, with no losses of product due to coal cleaning, are therefore very high, compared with typical Eastern coals, prepared for rail or barge shipment.

Differences in the relationships when comparing underground DRB and estimated recoverable reserves in Appalachia and the Interior likewise indicate differences in coal types, markets, and mining patterns (Tables 12 and 14). Appalachian underground coal makes up 23 percent of the DRB but accounts for 25 percent of the estimated U.S. recoverable reserves. Accessibility is not as restricted for underground mining in Appalachia and has fewer restrictions than the surface mines of the region. Again, the exception to the rule is Pennsylvania anthracite, where access for deep mining is severely restricted now and for the foreseeable future as a result of catastrophic flooding caused by Hurricane Agnes in 1972, drowning many of the mines and impairing adjacent resources. In general, however, net recovery of Appalachian deep coal deposits is good, primarily because much of the coal being mined is relatively high-quality, high-Btu fuel. The coal fetches prices that can support more costly mining technologies, including longwalls (67 percent of U.S. longwall production is in Appalachia[22]).

By contrast, 35 percent of the national DRB for underground mining is found in the Interior Region, but the estimated recoverable reserves constitute only 27 percent. The coalbeds in the Interior include a high percentage of thick beds, yet the net underground recovery is relatively low (52 percent versus 58 percent in Appalachia[23]). This lower recovery correlates with a region of high average sulfur contents, flat markets, and relatively low prices ($22.43 for Interior bituminous versus $27.67 for Appalachian bituminous, mined underground, average price per ton for calendar year 1996[24]).

Status of Coal Reserves Data Base

The Coal Reserves Data Base program is EIA's vehicle for revision of the DRB, estimated recoverable reserves, and coal quality allocations. The CRDB data are revised using coal resource data and coal quality analyses sampled in and selected for their applicability to the coal resources. For the coal supply areas where CRDB projects are not currently feasible, the EIA continues periodic adjustments of the existing data to account for resource depletion. This is done to maintain a unified national database of the remaining DRB and estimated recoverable reserves adjusted to the latest common effective date.

A "base year" (Table 15) is the effective date of the detailed resource assessment for a DRB resource area, including adjustments for all known coal mined out and/or lost to mining as of the stated date. Some source studies on which the DRB is based may be much older than the base year or may have been done at various times over a range of years. A latest common effective date is used to maintain internal database consistency. It is the "as of" date to which data of varying base years are adjusted to account for subsequent production and coal lost in mining.

Although major updates are being made in the CRDB, some important coal supply areas are still based on 1971 base year DRB data and on allocations performed in the 1980s for the EIA's Resource Allocation and Mine Costing (RAMC) model (Table 15). The DRB covers all

[22] Energy Information Administration, *Coal Industry Annual 1996*, DOE/EIA-0584(96) (Washington, DC, November 1997), p. 11.
[23] *Ibid.* p. 41.
[24] *Ibid.* p. 157.

Table 15. 1997 Status of Database Updates for Energy Information Administration (EIA) Coal Resource and Reserve Data

Update Year	Base Year	Lead Agency	State or Producing Area	Source Comments
1996	1993	Kentucky Geological Survey	Eastern Kentucky field	1983 coal resource data, State coal analyses, USGS availability data, EIA recovery and accessibility data.
1997	1996	Illinois State Geological Survey	Illinois	State coal mapping system, coal analyses, USGS availability data, State and EIA recovery data and accessibility standards.
1994	1993	New Mexico Bureau of Mines and Mineral Resources	New Mexico portion of San Juan Basin and its southern extensions	State mapping system and coal quality data, company data, BLM land use data, State and EIA depletion and recovery data.
1995	1991	EIA	New Mexico portion of Raton Basin	Resource data from published report, accessibility estimated, EIA recovery data.
1992	1981	EIA	Pennsylvania (anthracite)	Resource data and accessibility from published study, EIA recovery estimates.
1992	1991	Geological Survey of Wyoming	Wyoming, surface-minable DRB of major coalfields	State coal resource files and published studies, State coal analyses and FERC data, USGS maps for land use, State and EIA production and active-mines reserve data.
1991	1991	Ohio Geological Survey	Major coal-bearing counties of Ohio	Resources from new State data points, State coal analyses, except: published study for non-priority counties; accessibility from State estimates and EIA analysis of National Forest and roadway restrictions.
1991	1979 (based on 1946-1980 studies)	EIA	Arkansas, Colorado, New Mexico, and Virginia (anthracite fields), Alaska (northern), Georgia, Idaho, Michigan, North Carolina, Oregon	DRBs allocated to Btu/sulfur ranges using EIA coal quality data and published coal analyses.
1980-1986	1971, (based on 1907-1971 data and 1972-1985 updates)	EIA (core Resource Allocation and Mine Costing Model file)	Alabama, Alaska (southern), Arizona, Arkansas, Colorado,* Indiana,* Iowa, Kansas, Kentucky (western), Louisiana, Maryland, Missouri, Montana, North Dakota, Oklahoma, Pennsylvania (bituminous), South Dakota, Tennessee, Texas, Utah,* Virginia, Washington, West Virginia, Wyoming (underground)	Basic Btu/sulfur allocations done in 1980 and 1986, based on 1971 DRB and extended to various updated DRB estimates from small post-1971 studies.

* Colorado revisions in the Somerset and Yampa Fields are under development. Revisions in Utah are in progress. Revisions in Indiana are scheduled to begin in January 1999.

States for which there are sufficient coal resource data to compute a reserve base. Beginning with the 1992 update year, coal quality allocations were extended to all DRB data, including those not used in RAMC, for which allocations had not previously been done. Table 15 summarizes the resource data sources and base years used in the 1997 DRB and estimated recoverable reserve updates.

Acronyms and Abbreviations Used

ASTM	American Society for Testing and Materials
BOM	U.S. Bureau of Mines
CAS	USGS Coal Availability Studies
CRDB	Coal Reserves Data Base
CRS	BOM Coal Recoverability Studies
DOE	U.S. Department of Energy
DRB	demonstrated reserve base
EIA	Energy Information Administration
FERC	Federal Energy Regulatory Commission
GIS	geographic information systems
ISGS	Illinois State Geological Survey
NCRA	National Coal Resource Assessment
NCRDS	National Coal Resource Data System
ROM	run of mine
USGS	U.S. Geological Survey

Glossary of Selected Coal Classification Terms

accessed—Coal deposits that have been prepared for mining by construction of portals, shafts, slopes, drifts, and haulage ways; by removal of overburden; or by partial mining (see also **virgin coal**).

accessibility—In reference to coal resources (core meaning), the absence of **land use restrictions** and the assumption that ownership or leaseholds will be obtainable for mining (see also **environmental restrictions, industrial restrictions**). Many **technological restrictions** were traditionally applied as demonstrated reserve base criteria, but (extended meaning) with the advent of **available resource** studies, specific technologic restrictions may be incorporated in **accessibility factors** (see also **restricted resources**).

accessibility factor—The estimated regional ratio of **accessible reserve base** to the **demonstrated reserve base** or of **accessible resources** to **identified resources**.

accessible reserve base—The portion of the **demonstrated reserve base** estimated by EIA to be accessible, determined by application of one or more **accessibility factors** within an area. An accessible reserve base may be referred to as **accessible resources** because it is a subset of accessible resources and is usually part of a single resource study.

accessible resources—The portion of **identified resources** estimated to be accessible, determined by application of one or more **accessibility factors** within an area.

as-received condition or as-received basis—Represents an analysis of a sample as received at a laboratory.

availability—In reference to coal resources, the absence of **land-use** or **environmental restrictions** and **technological restrictions**.

available reserves—In EIA coal supply modeling, the difference between **estimated recoverable reserves** and **recoverable reserves at active mines**; in modeling context, these reserves are considered not presently obligated for existing mines and, therefore, would be available to supply new mines in the future.

available resources—In U.S. Geological Survey studies, the quantity of remaining **identified resources** available for development and potential extraction at the time of determination after adjusting for geologic considerations, land-use restrictions, and/or **technological restrictions** (see also **accessible reserve base**).

bed, coalbed—All the coal and partings lying between a roof and floor.

bench—A subdivision and (or) layer of a coal bed separated from other layers by partings of non-coal rock.

clean coal yield—In EIA models, the portion of reserves that will be salable coal after preparation, if any is done (see **salable coal**).

coal—A readily combustible rock containing more than 50 percent by weight and more than 70 percent by volume of carbonaceous material, including inherent moisture. It is formed from plant remains that have been compacted, indurated, chemically altered, and metamorphosed by heat and pressure during geologic time. *Discussion:* Differences in the kinds of plant materials, in the degree of metamorphism (rank), and in the range of impurities are characteristic of coal and are used in coal classification. Impure coal/coaly material containing more than 33 weight percent ash is excluded from resources and reserve estimates unless the ash is largely in associated partings so that the coal is cleanable to less than 33 weight percent ash.

coal preparation/washing—The treatment of coal to reject waste. In its broadest sense, preparation is any processing of mined coal to prepare it for market, including crushing and screening or sieving the coal to reach a uniform size, which normally results in removal of some non-coal material. The term coal preparation most commonly refers to processing, including crushing and screening, passing the material through one or more processes to remove impurities, sizing the product, and loading for shipment. Many of the processes separate rock, clay, and other minerals from coal in a liquid medium; hence the term washing is widely used. In some cases coal passes through a drying step before loading.

coal-producing region—An area that collectively encompasses a group of geographically contiguous or logically associated States or areas that currently or historically mine and market coal.

coal sampling—The collection and proper storage and handling of a relatively small quantity of coal for laboratory analysis. Sampling may be done for a wide range of purposes, such as: coal resource exploration and assessment, characterization of the reserves or production of a mine, to characterize the results of coal cleaning processes, to monitor coal shipments or receipts for adherence to coal quality contract specifications, or to subject a coal to specific combustion or reactivity tests related to the customer's intended use. During pre-development phases, such as exploration and resource assessment, sampling typically is from natural outcrops, test pits, old or existing mines in the region, drill cuttings, or drilled cores. Characterization of a mine's reserves or production may use sample collection in the mine, representative cuts from coal conveyors or from handling and loading equipment, or directly from stockpiles or shipments (coal rail cars or barges). Contract specifications rely on sampling from the production flow at the mining or coal handling facility or at the loadout, or from the incoming shipments at the receiver's facility. In all cases, the value of a sample taken depends on its being representative of the coal under consideration, which in turn requires that appropriate sampling procedures be carefully followed.

For coal resource and estimated reserve characterization, appropriate types of samples include:

> **face channel** or **channel sample**—a sample taken at the exposed coal in a mine by cutting away any loose or weathered coal then collecting on a clean surface a sample of the coal seam by chopping out a channel of uniform width and depth; a face channel or face sample is taken at or near the working face, the most freshly exposed coal where actual removal and loading of mined coal is taking place. Any partings greater than 3/8 inch and/or mineral concretions greater than ½ inch thick and 2 inches in maximum diameter are normally discarded from a channel sample so as better to represent coal that has been mined, crushed, and screened to remove at least gross non-coal materials.
>
> **column sample**—a **channel** or drill core sample taken to represent the entire geologic coalbed; it includes all partings and impurities that may exist in the coalbed.
>
> **bench sample**—a **face** or **channel** sample taken of just that contiguous portion of a coalbed that is considered practical to mine, also known as a "bench;" For example, bench samples may be taken of minable coal where impure coal that makes up part of the geologic coalbed is likely to be left in the mine, or where thick partings split the coal into two or more distinct minable seams, or where extremely thick coalbeds cannot be recovered by normal mining equipment, so that the coal is mined in multiple passes, or benches, usually defined along natural bedding planes.
>
> **composite sample**—a recombined coalbed sample produced by averaging together thickness-weighted coal analyses from partial samples of the coalbed, such as from one or more bench samples, from one or more mine exposures or outcrops where the entire bed could not be accessed in one sample, or from multiple drill cores that were required to retrieve all local sections of a coal seam.

coal supply region—An area in which the EIA coal reserves data are aggregated and allocated to a set of uniform, typical criteria for purposes of modeling. The criteria of a coal supply region may include coal heat and sulfur content or other quality parameters, coal rank, geographic continuity, traditional mining regions, State or county boundaries, transportation corridors and barriers, and marketing factors. Coal supply regions may vary for different modeling criteria; they may include the coal reserves of an entire State or a contiguous group of States; some major producing States may be split into more than one region.

coal zone—A series of laterally extensive and (or) lenticular coal beds and associated strata that arbitrarily can be viewed as a unit. Generally, the coal beds in a coal zone are assigned to the same geologic member or formation.

coalbed—All the coal and partings lying between a roof and floor.

committed reserves—In EIA coal supply modeling, synonymous with **recoverable reserves at active mines**; in modeling context, these reserves are considered obligated for existing mines and, therefore, not part of the reserves that would be available to supply new mines in the future.

compliance coal—A coal or a blend of coals that meets sulfur dioxide emission standards for air quality without the need for flue gas desulfurization.

cumulative depletion—The sum in tons of coal extracted and lost in mining to a stated date for a specified area or a specified coal bed.

demonstrated reserve base (DRB)—A collective term for the sum of coal in both measured and indicated resource categories of reliability; the DRB represents 100 percent of coal in place as of a certain date. Includes beds of bituminous coal and anthracite 28 inches or more thick and beds of subbituminous coal 60 inches or more thick that can be surface mined. Includes also thinner and/or deeper beds that presently are being mined or for which there is evidence that they could be mined commercially at this time. Represents that portion of the **identified resources** of coal from which reserves are calculated.

demonstrated resources—Same qualifications as **identified resources**, but includes measured and indicated degrees of geologic assurance and excludes the inferred.

depleted resources—Resources that have been mined; includes coal recovered, coal lost in mining, and coal rendered subeconomic as a result of mining the recovered coal. See **cumulative depletion**.

depletion—The subtraction of both the tonnage produced and the tonnage lost in mining from the **demonstrated reserve base** and **identified resources** to determine the remaining tonnage as of a certain time.

depletion factor—The multiplier of the tonnage produced that takes into account both the tonnage recovered and the tonnage lost due to mining. The depletion factor is the reciprocal of the **recovery factor** in relation to a given quantity of production.

dry, mineral-matter-free basis—A type of calculated analytical value of a coal sample expressed as if the total moisture and mineral matter had been removed. Mineral matter free is not the same as ash free.

economic—Term that implies that profitable extraction or production under realistic investment assumptions has been established, analytically demonstrated, or assumed with reasonable certainty.

environmental restrictions—**Land-use** or subsurface restrictions that constrain, postpone, or prohibit mining in order to protect environmental resources of an area; for example, surface- or groundwater quality, air quality affected by mining, or plants or animals or their habitats.

estimate—A determination as to the amount or tonnage of coal in an area. The term estimate indicates that the quantities of resources are known imprecisely. An estimate differs from an assessment, which is an analysis of all data concerning an area's coal resources and reserves with the objective of reaching a judgment about the geologic nature and economic potential of the coal resources and reserves of the area.

estimated recoverable reserves—See **recoverable reserves**.

floor—The upper surface of the stratum underlying a coal seam. In coals that were formed in persistent swamp environments, the floor is typically a bed of clay, known as "underclay," representing the soil in which the trees or other coal-forming swamp vegetation was rooted.

geologic assurance—State of sureness, confidence, or certainty of the existence of a quantity of resources based on the distance from points where coal is measured or sampled and on the abundance and quality of geologic data as related to thickness of overburden, rank, quality, thickness of coal, areal extent, geologic history, structure, and correlations of coal beds and enclosing rocks. The degree of assurance increases as the nearness to points of control, abundance, and quality of geologic data increases.

geologic considerations—Conditions in the coal deposit or in the rocks in which it occurs that may complicate or preclude mining. Geologic considerations are evaluated in the context of the current state of technology and regulations, so the impact on mining may change with time.

grade (of coal)—See **quality**.

hypothetical resources—**Undiscovered coal resources** in beds that may reasonably be expected to exist in known mining districts under known geologic conditions. In general, hypothetical resources are in broad areas of coalfields where points of observation are absent and evidence is from distant outcrops, drill holes, or wells. Exploration that confirms their existence and better defines their quantity and quality would permit their reclassification as **identified resources**. Quantitative estimates are based on a broad knowledge of the geologic character of coalbed or region. Measurements

of coal thickness are more than 6 miles apart. The assumption of continuity of coalbed is supported only by geologic evidence.

identified resources—Specific bodies of coal whose location, rank, quality, and quantity are known from geologic evidence supported by engineering measurements. Included are beds of bituminous coal and anthracite 14 inches or more thick and beds of subbituminous coal and lignite 30 inches or more thick that occur at depths to 6,000 feet and whose existence and quantity have been delineated within specified degrees of geologic assurance as measured, indicated, or inferred.

indicated resources—Coal for which estimates of the rank, quality, and quantity have been computed partly from sample analyses and measurements and partly from reasonable geologic projections. Indicated resources are computed partly from specified measurements and partly from projection of visible data for a reasonable distance on the basis of geologic evidence. The points of observation are 0.5 to 1.5 miles apart. Indicated coal is projected to extend as a 0.5-mile-wide belt that lies more than 0.25 miles from the outcrop or points of observation or measurement.

industrial restrictions—**Land-use restrictions** that constrain, postpone, or prohibit mining in order to meet other industrial needs or goals; for example, resources not mined due to safety concerns or due to industrial or societal priorities, such as to preserve oil or gas wells that penetrate the coal reserves; to protect surface features such as pipelines, power lines, or company facilities; or to preserve public or private assets, such as highways, railroads, parks, or buildings.

inferred reserve base—the resources in the inferred reliability category that meet the same criteria of bed thickness and depth from surface as the **demonstrated reserve base**.

inferred resources—Coal in unexplored extensions of **demonstrated resources** for which estimates of the quality and size are based on geologic evidence and projection. Quantitative estimates are based largely on broad knowledge of the geologic character of the bed or region and where few measurements of bed thickness are available. The estimates are based primarily on an assumed continuation from demonstrated coal for which there is geologic evidence. The points of observation are 1.5 to 6 miles apart. Inferred coal is projected to extend as a 2.25-mile-wide belt that lies more than 0.75 miles from the outcrop or points of observation or measurement.

isopach—A line on a map drawn through points of equal thickness of a designated unit (such as a coal bed).

land-use restrictions—Constraints placed upon mining by societal policies to protect surface features or entities that could be affected by mining. Because laws and regulations may be modified or repealed, the restrictions, including industrial and environmental restrictions, are subject to change.

marginal reserves—Borders on being economic. See **economic**.

measured resources—Coal for which estimates of the rank, quality, and quantity have been computed, within a high degree of geologic assurance, from sample analyses and measurements from closely spaced and geologically well known sample sites. Measured resources are computed from dimensions revealed in outcrops, trenches, mine workings, and drill holes. The points of observation and measurement are so closely spaced and the thickness and extent of coals are so well defined that (for older estimates) the tonnage was judged to be accurate within 20 percent of true tonnage (statistical measures of error are no longer considered reliable for most measured resources). Although the spacing of the points of observation necessary to demonstrate continuity of the coal differs from region to region according to the character of the coalbeds, the points of observation are not greater than 0.5 mile apart. Measured coal is projected to extend as a 0.25-mile-wide belt from the outcrop or points of observation or measurement.

minable—Capable of being mined under current mining technology and environmental and legal restrictions, rules, and regulations.

original (resources/reserves)—The amount of coal in the ground before any production.

overburden—Any material, consolidated or unconsolidated, that lies between a coal deposit and the surface. Overburden is reported in feet and (or) meters and used to classify the depth to an underlying coal bed.

preparation plant—Broadly speaking, any facility where coal is prepared for market; usual accepted meaning is a rather elaborate collection of facilities where coal is separated from its impurities, washed and sized, and

loaded for shipment. Also known as a wash plant or coal washer.

quality or grade—An informal classification of coal relating to its suitability for use for a particular purpose. Refers to individual measurements such as heat value, fixed carbon, moisture, ash, sulfur, phosphorus, major, minor, and trace elements, coking properties, petrologic properties, and particular organic constituents. The individual quality elements may be aggregated in various ways to classify coal for such special purposes as metallurgical, gas, petrochemical, and blending usages.

rank—The classification of coal relative to other coals, according to their degree of metamorphism, or progressive alteration, in the natural series from lignite to anthracite (Standard Classification of Coal by Rank, 1992, American Society for Testing and Materials, ASTM Designation D-388-91a).

recoverability—In reference to accessible coal resources, the condition of being physically, technologically, and economically minable. **Recovery rates** and **recovery factors** may be determined or estimated for coal resources without certain knowledge of their economic minability; therefore, the availability of recovery rates or factors does not predict recoverability.

recoverable coal—Coal that is, or can be, extracted from a coal bed during mining.

recoverable reserves, estimated recoverable reserves—Reserve estimates (broad meaning) based on a **demonstrated reserve base** adjusted for assumed **accessibility factors** and **recovery factors**. The term is used by EIA to distinguish estimated recoverable reserves, which are derived without specific economic feasibility criteria by factoring (downward) from a demonstrated reserve base for one or more study areas or regions, from **recoverable reserves at active mines**, which are aggregated (upward) from reserve estimates reported by currently active, economically viable mines on Form EIA-7A.

recoverable reserves at active mines—The amount of in situ coal that can be recovered by mining existing reserves at mines reporting on Form EIA-7A (see **committed reserves**).

recovery factor—The percentage of total tons of coal estimated to be recoverable from a given area in relation to the total tonnage estimated to be in the **demonstrated reserve base**. For the purpose of calculating **depletion factors** only, the estimated recovery factors for the **demonstrated reserve base** generally are 50 percent for underground mining methods and 80 percent for surface mining methods. More precise recovery factors can be computed by determining the total coal in place and the total coal recoverable in any specific locale.

recovery percentage/rate—The ratio of coal extracted from a bed as compared to the total quantity of coal originally in the bed.

remaining (resources/reserves)—The amount of coal in the ground after some mining, excluding coal in the ground spoiled or left in place for which later recovery is not feasible.

regional reserves, regional reserve estimates—Same as **reserves**; alternative wording is used by EIA to distinguish regional reserves, which are derived by factoring (downward) from a demonstrated reserve base for one or more study areas or regions, from **reserves at active mines**, which are aggregated (upward) from reserve estimates reported by individual mines on Form EIA-7A.

remaining (resources/reserves)—The amount of coal in the ground after some mining, excluding coal in the ground spoiled or left in place for which later recovery is not feasible.

reserve(s)—Root meaning: The amount of in-situ coal in a defined area that can be recovered by mining at a sustainable profit at the time of determination. Broad meaning: That portion of the **demonstrated reserve base** that is estimated to be recoverable at the time of determination. The reserve is derived by applying a **recovery factor** to that component of the **identified resources** of coal designated as the **demonstrated reserve base**.

reserves at active mines—The amount of in situ coal that can be recovered by mining existing reserves at mines reporting on Form EIA-7A (see **committed reserves**).

resources—Naturally occurring concentrations or deposits of coal in the Earth's crust, in such forms and amounts that economic extraction is currently or potentially feasible.

restricted coal resources—In U.S. Geological Survey studies, the quantity of remaining resources that is not available for development at the time of determination because of **geologic considerations, land-use restrictions**, and/or **technological restrictions.**

restricted resources—Those parts of any resource category that are restricted or prohibited from extraction by laws or regulations. Also, coal or a portion of the coal in categorically minable depths or thicknesses that is not economic at the time of determination.

roof—The rock immediately above a coal seam. The roof is commonly a shale, often carbonaceous and softer than rocks higher up in the roof strata.

run-of-mine—The raw coal recovered from a mine, prior to any treatment.

salable coal—The shippable product of a coal mine or **preparation plant**. Depending on customer specifications, salable coal may be **run-of-mine**, crushed-and-screened (sized) coal, or the clean coal yield from a preparation plant.

sample—A representative fraction of a coal bed collected by approved methods, guarded against contamination or adulteration, and analyzed to determine the nature; chemical, mineralogic, and (or) petrographic composition; percentage or parts-per-million content of specified constituents; heat value; and possibly the reactivity of the coal or its constituents.

seam—A bed of coal lying between a roof and floor. Equivalent term to bed, commonly used by industry.

speculative resources—**Undiscovered** coal in beds that may occur either in known types of deposits in a favorable geologic setting where no discoveries have been made, or in deposits that remain to be recognized. Exploration that confirms their existence and better defines their quantity and quality would permit their reclassification as **identified resources**.

strip or stripping ratio—The amount of overburden that must be removed to gain access to a unit amount of coal.

Discussion: A stripping ratio may be expressed as (1) thickness of overburden to thickness of coal, (2) volume of overburden to volume coal, (3) weight of overburden to weight of coal, or (4) cubic yards of overburden to tons of coal. A stripping ratio commonly is used to express the maximum thickness, volume, or weight of overburden that can be profitably removed to obtain a unit amount of coal.

strip or surface mining—The extraction of coal by using surface mining methods such as area strip mining, contour strip mining, or open-pit mining. The overburden covering the coal is removed and the coal extracted using power shovels, front-end loaders, or similar heavy equipment.

technological restrictions—Constraints related to economics and safety placed upon mining by contemporary technology or prescribed by law; the restrictions may change with advances in science or modifications in the law. For purposes of assessing impacts on minability, **geologic considerations** are included as technological restrictions. A secondary basis for accessibility is the technological restrictions that may affect economic minability of specific coal resources in a locality at the time of the evaluation. Technological restrictions include constraints on the economic or safe mining of the coal with contemporary technologies, which constraints are related to the nature of the coalbeds or local geology; for example, specific coalbed thickness or overburden characteristics known to deter economic mining of coal meeting broad regional DRB criteria, localized geologic structural problems, or unsafe or illegal proximity to another mine.

underground mining—The extraction of coal or its products from between enclosing rock strata by underground mining methods, such as room and pillar, longwall, and shortwall, or through in-situ gasification.

undiscovered resources—Unspecified bodies of coal surmised to exist on the basis of broad geologic knowledge and theory. Undiscovered resources include beds of bituminous coal and anthracite 14 inches or more thick and beds of subbituminous coal and lignite 30 inches or more thick that are presumed to occur in unmapped and unexplored areas to depths of 6,000 feet. The **speculative** and **hypothetical resource** categories comprise undiscovered resources.

virgin coal—Coal that has not been accessed by mining. See **accessed**.

Appendix A

Detailed Estimates of Demonstrated Reserve Base and Estimated Recoverable Reserves for U.S. Coal by Heat and Sulfur Content

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining / Heat Content (Million Btu per Short Ton)	Sulfur Content (Pounds of Sulfur per Million Btu) ≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Alabama - Surface							
< 15	0.0	0.0	0.0	1,083.0	0.0	0.0	1,083.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	161.7	238.1	602.5	190.7	0.0	1,192.9
26+	0.0	193.6	136.9	650.0	0.0	0.0	980.4
Total	**0.0**	**355.2**	**375.0**	**2,335.4**	**190.7**	**0.0**	**3,256.3**
Alabama - Underground							
< 15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	138.5	197.8	272.9	107.8	0.0	716.9
26+	0.0	158.4	0.0	415.0	0.0	0.0	573.4
Total	**0.0**	**296.9**	**197.8**	**687.8**	**107.8**	**0.0**	**1,290.2**
Alabama - Total							
<15	0.0	0.0	0.0	1,083.0	0.0	0.0	1,083.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	300.1	435.9	875.3	298.4	0.0	1,909.7
26+	0.0	352.0	136.9	1,064.9	0.0	0.0	1,553.8
Total	**0.0**	**652.1**	**572.8**	**3,023.2**	**298.4**	**0.0**	**4,546.6**
Alaska, South - Surface							
<15	14.0	0.0	0.0	0.0	0.0	0.0	14.0
15-19.99	470.2	51.6	0.0	0.0	0.0	0.0	521.8
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**484.2**	**51.6**	**0.0**	**0.0**	**0.0**	**0.0**	**535.8**
Alaska, South - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	4,083.2	87.2	0.0	0.0	0.0	0.0	4,170.4
20-22.99	0.0	17.6	0.0	0.0	0.0	0.0	17.6
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**4,083.2**	**104.8**	**0.0**	**0.0**	**0.0**	**0.0**	**4,188.0**
Alaska, South - Total							
<15	14.0	0.0	0.0	0.0	0.0	0.0	14.0
15-19.99	4,553.4	138.8	0.0	0.0	0.0	0.0	4,692.2
20-22.99	0.0	17.6	0.0	0.0	0.0	0.0	17.6
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**4,567.4**	**156.4**	**0.0**	**0.0**	**0.0**	**0.0**	**4,723.8**
Alaska, North - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	17.4	4.9	3.9	2.4	0.0	0.0	28.5
20-22.99	77.3	39.1	0.0	0.0	0.0	0.0	116.3
23-25.99	16.7	5.7	0.0	0.0	0.0	0.0	22.4
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**111.3**	**49.6**	**3.9**	**2.4**	**0.0**	**0.0**	**167.2**
Alaska, North - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	129.4	36.1	28.3	17.9	0.0	0.0	211.7
20-22.99	569.4	286.5	0.0	0.0	0.0	0.0	855.9
23-25.99	125.6	41.9	0.0	0.0	0.0	0.0	167.5
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**824.3**	**364.4**	**28.3**	**17.9**	**0.0**	**0.0**	**1,235.0**
Alaska, North - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	146.8	40.9	32.2	20.3	0.0	0.0	240.2
20-22.99	646.7	325.5	0.0	0.0	0.0	0.0	972.2
23-25.99	142.2	47.6	0.0	0.0	0.0	0.0	189.9
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**935.6**	**414.1**	**32.2**	**20.3**	**0.0**	**0.0**	**1,402.2**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining / Heat Content (Million Btu per Short Ton)	Sulfur Content (Pounds of Sulfur per Million Btu) ≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Arizona - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	59.3	0.0	0.0	0.0	0.0	59.3
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**59.3**	**0.0**	**0.0**	**0.0**	**0.0**	**59.3**
Arizona - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	101.6	0.0	0.0	0.0	0.0	101.6
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**101.6**	**0.0**	**0.0**	**0.0**	**0.0**	**101.6**
Arizona - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	160.9	0.0	0.0	0.0	0.0	160.9
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**160.9**	**0.0**	**0.0**	**0.0**	**0.0**	**160.9**
Arkansas - Surface							
<15	0.0	0.0	0.0	25.3	0.0	0.0	25.3
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.5	0.5
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	2.2	104.2	9.2	1.5	1.5	118.7
Total	**0.0**	**2.2**	**104.2**	**34.5**	**1.5**	**2.0**	**144.4**
Arkansas - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	1.9	1.9
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	14.2	192.7	43.5	10.1	10.1	270.6
Total	**0.0**	**14.2**	**192.7**	**43.5**	**10.1**	**12.0**	**272.5**
Arkansas - Total							
<15	0.0	0.0	0.0	25.3	0.0	0.0	25.3
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	2.4	2.4
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	16.3	296.9	52.8	11.7	11.7	389.3
Total	**0.0**	**16.3**	**296.9**	**78.0**	**11.7**	**14.0**	**416.9**
Colorado - Surface							
<15	0.0	0.0	4,189.9	0.0	0.0	0.0	4,189.9
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	144.1	0.0	10.5	12.4	0.0	0.0	166.9
23-25.99	191.6	143.5	25.2	39.2	17.6	0.0	417.0
26+	0.0	3.6	0.0	0.0	0.0	0.0	3.6
Total	**335.6**	**147.1**	**4,225.5**	**51.6**	**17.6**	**0.0**	**4,777.4**
Colorado - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	2,666.2	1,099.1	64.4	0.0	0.0	0.0	3,829.6
20-22.99	1,418.7	1,564.4	239.3	151.7	0.0	0.0	3,374.1
23-25.99	2,159.1	1,214.1	311.1	306.3	155.1	0.0	4,145.6
26+	201.0	281.5	65.2	81.6	0.0	0.0	629.2
Total	**6,445.0**	**4,159.0**	**679.9**	**539.6**	**155.1**	**0.0**	**11,978.5**
Colorado - Total							
<15	0.0	0.0	4,189.9	0.0	0.0	0.0	4,189.9
15-19.99	2,666.2	1,099.1	64.4	0.0	0.0	0.0	3,829.6
20-22.99	1,562.8	1,564.4	249.7	164.1	0.0	0.0	3,541.1
23-25.99	2,350.6	1,357.6	336.3	345.5	172.6	0.0	4,562.6
26+	201.0	285.1	65.2	81.6	0.0	0.0	632.8
Total	**6,780.6**	**4,306.1**	**4,905.4**	**591.2**	**172.6**	**0.0**	**16,755.9**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Georgia - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.1	0.0	0.2	0.0	0.0	0.2
26+	0.3	0.5	0.5	0.0	0.1	0.1	1.5
Total	**0.3**	**0.6**	**0.5**	**0.2**	**0.1**	**0.1**	**1.7**
Georgia - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.1	0.0	0.1	0.0	0.0	0.2
26+	0.8	0.3	0.2	0.1	0.2	0.2	1.7
Total	**0.8**	**0.4**	**0.2**	**0.2**	**0.2**	**0.2**	**1.9**
Georgia - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.2	0.0	0.3	0.0	0.0	0.4
26+	1.1	0.8	0.6	0.1	0.3	0.3	3.2
Total	**1.1**	**1.0**	**0.6**	**0.4**	**0.3**	**0.3**	**3.6**
Idaho - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Idaho - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.3	2.1	1.0	1.0	0.0	0.0	4.4
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.3**	**2.1**	**1.0**	**1.0**	**0.0**	**0.0**	**4.4**
Idaho - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.3	2.1	1.0	1.0	0.0	0.0	4.4
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.3**	**2.1**	**1.0**	**1.0**	**0.0**	**0.0**	**4.4**
Illinois - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	8.8	122.0	130.8
20-22.99	0.0	0.0	4.2	293.6	500.7	14,095.5	14,893.9
23-25.99	0.0	0.0	1.4	45.9	80.4	1,456.0	1,583.6
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**5.5**	**339.5**	**589.9**	**15,673.5**	**16,608.4**
Illinois - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	199.4	683.7	1,088.6	2,867.4	2,438.8	48,004.8	55,282.8
23-25.99	2.4	33.9	251.0	1,502.0	1,503.4	29,875.6	33,168.3
26+	0.0	0.0	0.0	0.0	0.0	9.5	9.5
Total	**201.9**	**717.7**	**1,339.6**	**4,369.3**	**3,942.2**	**77,889.9**	**88,460.5**
Illinois - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	8.8	122.0	130.8
20-22.99	199.4	683.7	1,092.8	3,161.0	2,939.5	62,100.3	70,176.7
23-25.99	2.4	33.9	252.3	1,547.8	1,583.7	31,331.6	34,751.9
26+	0.0	0.0	0.0	0.0	0.0	9.5	9.5
Total	**201.9**	**717.7**	**1,345.1**	**4,708.8**	**4,532.0**	**93,563.4**	**105,068.9**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Indiana - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	67.5	34.7	144.5	0.0	262.5	509.2
23-25.99	0.0	35.0	9.3	28.9	241.1	233.1	547.4
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**102.5**	**44.0**	**173.4**	**241.1**	**495.6**	**1,056.7**
Indiana - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	335.6	263.2	744.6	1,272.7	2,353.2	4,969.2
23-25.99	0.0	262.6	116.5	621.6	1,080.2	1,809.6	3,890.6
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**598.2**	**379.8**	**1,366.2**	**2,352.9**	**4,162.8**	**8,859.8**
Indiana - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	403.1	298.0	889.1	1,272.7	2,615.7	5,478.5
23-25.99	0.0	297.6	125.8	650.5	1,321.4	2,042.7	4,438.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**700.7**	**423.8**	**1,539.6**	**2,594.0**	**4,658.4**	**9,916.5**
Iowa - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	457.0	0.0	457.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**457.0**	**0.0**	**457.0**
Iowa - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	187.3	1,545.2	1,732.5
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**187.3**	**1,545.2**	**1,732.5**
Iowa - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	644.3	1,545.2	2,189.5
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**644.3**	**1,545.2**	**2,189.5**
Kansas - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	75.9	432.7	508.6
23-25.99	0.0	0.0	0.0	0.0	246.2	151.7	397.9
26+	0.0	0.0	0.0	0.0	0.0	68.4	68.4
Total	**0.0**	**0.0**	**0.0**	**0.0**	**322.1**	**652.9**	**975.0**
Kansas - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Kansas - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	75.9	432.7	508.6
23-25.99	0.0	0.0	0.0	0.0	246.2	151.7	397.9
26+	0.0	0.0	0.0	0.0	0.0	68.4	68.4
Total	**0.0**	**0.0**	**0.0**	**0.0**	**322.1**	**652.9**	**975.0**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Kentucky, Eastern - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	19.7	49.3	157.9	39.5	138.2	404.6
20-22.99	0.0	197.4	118.4	197.4	207.2	207.2	927.7
23-25.99	9.9	552.7	730.3	759.9	375.0	355.3	2,783.0
26+	236.9	2,161.3	1,125.1	1,381.6	592.1	227.0	5,724.0
Total	**246.7**	**2,931.1**	**2,023.1**	**2,496.8**	**1,213.9**	**927.7**	**9,839.3**
Kentucky, Eastern - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	4.5	11.3	36.1	9.0	31.6	92.4
20-22.99	0.0	45.1	27.0	45.1	47.3	47.3	211.9
23-25.99	2.3	126.2	166.8	173.5	85.7	81.1	635.5
26+	54.1	493.6	256.9	315.5	135.2	51.8	1,307.1
Total	**56.3**	**669.3**	**462.0**	**570.2**	**277.2**	**211.9**	**2,246.9**
Kentucky, Eastern - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	24.2	60.6	194.0	48.5	169.7	497.0
20-22.99	0.0	242.5	145.5	242.5	254.6	254.6	1,139.5
23-25.99	12.1	678.9	897.1	933.4	460.7	436.4	3,418.6
26+	290.9	2,654.8	1,382.0	1,697.2	727.4	278.8	7,031.1
Total	**303.1**	**3,600.4**	**2,485.1**	**3,067.0**	**1,491.1**	**1,139.5**	**12,086.2**
Kentucky, Western - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	59.0	696.1	666.5	1,421.6
23-25.99	0.0	0.0	0.0	139.1	744.2	1,354.2	2,237.5
26+	0.0	0.0	0.0	0.0	29.4	5.1	34.5
Total	**0.0**	**0.0**	**0.0**	**198.0**	**1,469.7**	**2,025.7**	**3,693.5**
Kentucky, Western -Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	13.8	1,880.3	2,655.8	4,549.8
23-25.99	0.0	0.0	0.0	59.9	1,848.1	9,120.6	11,028.5
26+	0.0	0.0	0.0	0.0	472.0	210.6	682.6
Total	**0.0**	**0.0**	**0.0**	**73.6**	**4,200.3**	**11,986.9**	**16,260.9**
Kentucky, Western - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	72.7	2,576.4	3,322.3	5,971.4
23-25.99	0.0	0.0	0.0	199.0	2,592.3	10,474.7	13,266.0
26+	0.0	0.0	0.0	0.0	501.4	215.6	717.1
Total	**0.0**	**0.0**	**0.0**	**271.7**	**5,670.1**	**14,012.7**	**19,954.4**
Louisiana - Surface							
<15	0.0	0.0	0.0	462.7	0.0	0.0	462.7
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**462.7**	**0.0**	**0.0**	**462.7**
Louisiana - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Louisiana - Total							
<15	0.0	0.0	0.0	462.7	0.0	0.0	462.7
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**462.7**	**0.0**	**0.0**	**462.7**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining / Heat Content (Million Btu per Short Ton)	Sulfur Content (Pounds of Sulfur per Million Btu) ≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Maryland - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	23.5	0.0	23.5
26+	0.0	3.9	11.5	18.5	22.9	0.0	56.8
Total	**0.0**	**3.9**	**11.5**	**18.5**	**46.3**	**0.0**	**80.2**
Maryland - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	194.0	0.0	194.0
26+	0.0	50.9	88.6	188.2	115.2	0.0	442.8
Total	**0.0**	**50.9**	**88.6**	**188.2**	**309.1**	**0.0**	**636.8**
Maryland - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	217.4	0.0	217.4
26+	0.0	54.8	100.2	206.6	138.0	0.0	499.6
Total	**0.0**	**54.8**	**100.2**	**206.6**	**355.5**	**0.0**	**717.0**
Michigan - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.1	0.0	0.1
20-22.99	0.0	0.0	0.2	0.6	0.1	0.1	0.9
23-25.99	0.0	0.0	0.5	2.0	0.5	0.3	3.2
26+	0.0	0.0	0.0	0.2	0.1	0.0	0.4
Total	**0.0**	**0.0**	**0.7**	**2.7**	**0.8**	**0.4**	**4.6**
Michigan - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.8	0.0	0.8
20-22.99	0.0	0.0	6.6	10.3	6.8	6.5	30.2
23-25.99	0.0	0.0	10.6	32.1	21.7	17.3	81.8
26+	0.0	0.0	0.0	4.8	5.6	0.0	10.4
Total	**0.0**	**0.0**	**17.2**	**47.2**	**34.8**	**23.9**	**123.1**
Michigan - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.9	0.0	0.9
20-22.99	0.0	0.0	6.8	10.8	6.8	6.6	31.1
23-25.99	0.0	0.0	11.1	34.1	22.2	17.6	85.0
26+	0.0	0.0	0.0	5.0	5.7	0.0	10.7
Total	**0.0**	**0.0**	**17.9**	**49.9**	**35.6**	**24.2**	**127.7**
Missouri - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	77.8	2,822.7	2,900.5
23-25.99	0.0	0.0	0.0	0.0	136.7	1,437.7	1,574.4
26+	0.0	0.0	0.0	0.0	0.0	40.0	40.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**214.5**	**4,300.4**	**4,514.9**
Missouri - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	6.2	1,181.9	1,188.1
23-25.99	0.0	0.0	0.0	0.0	35.8	239.7	275.5
26+	0.0	0.0	0.0	0.0	0.0	15.5	15.5
Total	**0.0**	**0.0**	**0.0**	**0.0**	**42.0**	**1,437.1**	**1,479.1**
Missouri - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	84.0	4,004.6	4,088.6
23-25.99	0.0	0.0	0.0	0.0	172.5	1,677.4	1,849.9
26+	0.0	0.0	0.0	0.0	0.0	55.5	55.5
Total	**0.0**	**0.0**	**0.0**	**0.0**	**256.5**	**5,737.6**	**5,994.1**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Montana - Surface							
<15	1,860.3	3,720.6	5,842.3	1,546.2	1,860.3	930.2	15,759.8
15-19.99	20,125.1	4,957.5	5,979.9	1,497.4	184.1	214.5	32,958.3
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**21,985.4**	**8,678.1**	**11,822.2**	**3,043.6**	**2,044.4**	**1,144.7**	**48,718.2**
Montana - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	30,392.2	19,000.9	14,303.9	4,472.8	676.9	726.3	69,573.0
20-22.99	349.6	422.9	70.5	211.0	137.8	193.5	1,385.4
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**30,741.8**	**19,423.8**	**14,374.4**	**4,683.8**	**814.7**	**919.8**	**70,958.4**
Montana - Total							
<15	1,860.3	3,720.6	5,842.3	1,546.2	1,860.3	930.2	15,759.8
15-19.99	50,517.3	23,958.4	20,283.8	5,970.2	861.0	940.8	102,531.3
20-22.99	349.6	422.9	70.5	211.0	137.8	193.5	1,385.4
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**52,727.2**	**28,101.9**	**26,196.6**	**7,727.4**	**2,859.1**	**2,064.5**	**119,676.5**
New Mexico - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	1,045.2	1,214.9	2,194.4	0.0	0.0	4,454.4
20-22.99	0.0	479.7	397.4	884.6	0.0	0.0	1,761.8
23-25.99	0.0	10.0	0.0	7.3	0.0	0.0	17.3
26+	45.1	0.0	0.0	0.0	0.0	0.0	45.1
Total	**45.1**	**1,534.9**	**1,612.3**	**3,086.3**	**0.0**	**0.0**	**6,278.6**
New Mexico - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	1,225.6	516.4	1,423.2	0.0	0.0	3,165.2
20-22.99	0.0	843.5	604.2	654.2	0.0	0.0	2,102.0
23-25.99	0.0	565.2	0.3	31.8	0.0	0.0	597.4
26+	48.8	289.9	0.9	0.0	0.0	0.0	339.6
Total	**48.8**	**2,924.3**	**1,121.8**	**2,109.2**	**0.0**	**0.0**	**6,204.1**
New Mexico - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	2,270.8	1,731.3	3,617.5	0.0	0.0	7,619.6
20-22.99	0.0	1,323.3	1,001.6	1,538.8	0.0	0.0	3,863.8
23-25.99	0.0	575.2	0.3	39.2	0.0	0.0	614.7
26+	93.9	289.9	0.9	0.0	0.0	0.0	384.7
Total	**93.9**	**4,459.2**	**2,734.1**	**5,195.5**	**0.0**	**0.0**	**12,482.7**
North Carolina - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
North Carolina - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.7	2.9	3.6
26+	0.0	0.0	0.7	3.6	2.9	0.0	7.1
Total	**0.0**	**0.0**	**0.7**	**3.6**	**3.6**	**2.9**	**10.7**
North Carolina - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.7	2.9	3.6
26+	0.0	0.0	0.7	3.6	2.9	0.0	7.1
Total	**0.0**	**0.0**	**0.7**	**3.6**	**3.6**	**2.9**	**10.7**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining / Heat Content (Million Btu per Short Ton)	Sulfur Content (Pounds of Sulfur per Million Btu) ≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
North Dakota - Surface							
<15	566.6	975.5	1,788.2	4,470.5	1,114.4	479.9	9,395.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**566.6**	**975.5**	**1,788.2**	**4,470.5**	**1,114.4**	**479.9**	**9,395.0**
North Dakota - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
North Dakota - Total							
<15	566.6	975.5	1,788.2	4,470.5	1,114.4	479.9	9,395.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**566.6**	**975.5**	**1,788.2**	**4,470.5**	**1,114.4**	**479.9**	**9,395.0**
Ohio - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	18.1	33.8	92.5	280.5	633.0	1,058.0
23-25.99	30.5	84.6	134.4	439.0	943.1	2,583.7	4,215.1
26+	0.0	40.7	82.4	105.9	106.3	266.8	602.0
Total	**30.5**	**143.4**	**250.5**	**637.4**	**1,329.9**	**3,483.5**	**5,875.2**
Ohio - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	9.1	10.5	156.0	639.4	1,477.6	2,292.6
23-25.99	139.5	111.7	288.8	1,021.9	2,556.9	8,221.6	12,340.4
26+	0.0	42.0	78.5	285.9	809.2	1,940.1	3,155.7
Total	**139.5**	**162.8**	**377.8**	**1,463.8**	**4,005.5**	**11,639.3**	**17,788.7**
Ohio - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	27.2	44.3	248.5	920.0	2,110.7	3,350.7
23-25.99	170.0	196.3	423.1	1,460.9	3,500.0	10,805.3	16,555.5
26+	0.0	82.6	160.9	391.9	915.5	2,206.8	3,757.7
Total	**170.0**	**306.1**	**628.3**	**2,101.2**	**5,335.4**	**15,122.8**	**23,663.9**
Oklahoma - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	26.4	26.4
23-25.99	0.0	28.6	4.9	8.9	14.2	88.5	145.1
26+	0.0	64.6	30.2	38.8	32.9	0.0	166.5
Total	**0.0**	**93.2**	**35.1**	**47.7**	**47.1**	**114.9**	**338.0**
Oklahoma - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	64.8	64.8
23-25.99	0.0	61.2	83.4	75.3	55.7	148.9	424.4
26+	0.0	269.7	126.9	234.7	116.6	0.0	747.8
Total	**0.0**	**330.8**	**210.3**	**310.0**	**172.2**	**213.7**	**1,237.1**
Oklahoma - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	91.2	91.2
23-25.99	0.0	89.8	88.3	84.2	69.8	237.4	569.5
26+	0.0	334.3	157.0	273.5	149.5	0.0	914.3
Total	**0.0**	**424.0**	**245.4**	**357.7**	**219.3**	**328.6**	**1,575.0**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Oregon - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.8	0.4	0.6	0.0	0.2	0.2	2.3
20-22.99	0.4	0.0	0.2	0.0	0.0	0.0	0.6
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**1.3**	**0.4**	**0.8**	**0.0**	**0.2**	**0.2**	**2.9**
Oregon - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	4.2	2.1	3.1	0.0	1.0	1.0	11.4
20-22.99	2.1	0.0	1.0	0.0	0.0	0.0	3.1
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**6.2**	**2.1**	**4.2**	**0.0**	**1.0**	**1.0**	**14.5**
Oregon - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	5.0	2.5	3.7	0.0	1.3	1.3	13.7
20-22.99	2.5	0.0	1.3	0.0	0.0	0.0	3.7
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**7.5**	**2.5**	**5.0**	**0.0**	**1.3**	**1.3**	**17.5**
Pennsylvania, Anthracite - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	10.9	2.0	3.9	0.0	0.0	16.8
23-25.99	426.6	1,687.0	430.7	75.1	11.1	4.1	2,634.5
26+	97.5	493.9	108.2	18.9	0.2	0.0	718.7
Total	**524.1**	**2,191.8**	**540.9**	**97.9**	**11.3**	**4.1**	**3,370.0**
Pennsylvania, Anthracite - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	13.2	0.0	3.9	0.0	0.0	17.1
23-25.99	864.0	1,905.6	251.7	30.5	4.3	0.0	3,056.1
26+	196.9	415.2	135.1	26.6	2.5	0.0	776.3
Total	**1,061.0**	**2,334.0**	**386.9**	**61.0**	**6.8**	**0.0**	**3,849.5**
Pennsylvania, Anthracite - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	24.1	2.0	7.8	0.0	0.0	33.9
23-25.99	1,290.6	3,592.6	682.4	105.6	15.4	4.1	5,690.6
26+	294.5	909.0	243.3	45.5	2.7	0.0	1,495.0
Total	**1,585.1**	**4,525.7**	**927.8**	**158.9**	**18.0**	**4.1**	**7,219.5**
Pennsylvania, Bituminous - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	38.7	17.9	56.6
23-25.99	0.0	6.5	27.6	147.4	143.4	125.0	449.9
26+	0.0	24.4	61.2	276.3	132.1	44.0	537.9
Total	**0.0**	**30.9**	**88.8**	**423.7**	**314.1**	**186.9**	**1,044.4**
Pennsylvania, Bituminous - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	95.1	244.4	225.0	564.5
23-25.99	0.0	94.9	239.1	2,129.3	2,836.7	1,658.0	6,957.8
26+	0.0	387.1	1,136.3	6,472.8	4,187.5	676.2	12,859.9
Total	**0.0**	**482.0**	**1,375.4**	**8,697.1**	**7,268.5**	**2,559.1**	**20,382.2**
Pennsylvania, Bituminous - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	95.1	283.1	242.9	621.1
23-25.99	0.0	101.4	266.6	2,276.7	2,980.0	1,783.0	7,407.7
26+	0.0	411.5	1,197.5	6,749.1	4,319.5	720.2	13,397.8
Total	**0.0**	**512.9**	**1,464.2**	**9,120.8**	**7,582.6**	**2,746.1**	**21,426.6**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
South Dakota - Surface							
<15	0.0	0.0	137.0	1.0	228.1	0.0	366.1
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**137.0**	**1.0**	**228.1**	**0.0**	**366.1**
South Dakota - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
South Dakota - Total							
<15	0.0	0.0	137.0	1.0	228.1	0.0	366.1
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**137.0**	**1.0**	**228.1**	**0.0**	**366.1**
Tennessee - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	107.1	0.0	0.0	107.1
26+	0.0	56.4	34.1	28.3	58.3	0.0	177.1
Total	**0.0**	**56.4**	**34.1**	**135.4**	**58.3**	**0.0**	**284.3**
Tennessee - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	177.2	0.0	0.0	177.2
26+	0.0	121.3	68.7	58.7	105.6	0.0	354.3
Total	**0.0**	**121.3**	**68.7**	**235.9**	**105.6**	**0.0**	**531.5**
Tennessee - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	284.3	0.0	0.0	284.3
26+	0.0	177.7	102.8	87.0	164.0	0.0	531.4
Total	**0.0**	**177.7**	**102.8**	**371.3**	**164.0**	**0.0**	**815.7**
Texas - Surface							
<15	0.0	0.0	759.1	7,304.2	4,383.8	483.9	12,931.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**759.1**	**7,304.2**	**4,383.8**	**483.9**	**12,931.0**
Texas - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Texas - Total							
<15	0.0	0.0	759.1	7,304.2	4,383.8	483.9	12,931.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**759.1**	**7,304.2**	**4,383.8**	**483.9**	**12,931.0**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Utah - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	34.7	21.9	106.8	44.0	42.6	250.0
23-25.99	9.0	4.9	1.8	0.0	0.0	0.0	15.7
26+	1.3	0.9	0.0	0.0	0.0	0.0	2.2
Total	**10.3**	**40.5**	**23.7**	**106.8**	**44.0**	**42.6**	**267.9**
Utah - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.6	0.6	0.0	0.0	0.0	1.1
20-22.99	0.0	770.5	922.0	1,561.1	379.7	535.0	4,168.3
23-25.99	606.4	342.5	148.9	0.0	0.0	0.0	1,097.9
26+	134.8	180.4	0.0	0.0	0.0	0.0	315.2
Total	**741.2**	**1,294.0**	**1,071.5**	**1,561.1**	**379.7**	**535.0**	**5,582.5**
Utah - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.6	0.6	0.0	0.0	0.0	1.1
20-22.99	0.0	805.2	943.9	1,667.9	423.7	577.6	4,418.3
23-25.99	615.4	347.4	150.7	0.0	0.0	0.0	1,113.6
26+	136.1	181.3	0.0	0.0	0.0	0.0	317.4
Total	**751.5**	**1,334.5**	**1,095.2**	**1,667.9**	**423.7**	**577.6**	**5,850.4**
Virginia - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	3.3	12.7	106.3	0.0	0.0	0.0	122.4
26+	61.8	284.3	136.7	68.6	0.0	0.0	551.5
Total	**65.1**	**297.1**	**243.0**	**68.6**	**0.0**	**0.0**	**673.8**
Virginia - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	13.4	9.1	13.3	0.0	0.0	0.0	35.7
23-25.99	65.1	135.2	121.7	7.6	0.0	0.0	329.6
26+	175.2	581.5	268.4	137.7	0.0	0.0	1,162.8
Total	**253.7**	**725.8**	**403.3**	**145.3**	**0.0**	**0.0**	**1,528.2**
Virginia - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	13.4	9.1	13.3	0.0	0.0	0.0	35.7
23-25.99	68.4	147.9	228.0	7.6	0.0	0.0	452.0
26+	237.1	865.9	405.1	206.3	0.0	0.0	1,714.3
Total	**318.8**	**1,022.9**	**646.3**	**213.9**	**0.0**	**0.0**	**2,202.0**
Washington - Surface							
<15	0.0	0.0	8.1	0.0	0.0	0.0	8.1
15-19.99	0.0	0.0	0.0	49.3	0.0	0.0	49.3
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**8.1**	**49.3**	**0.0**	**0.0**	**57.4**
Washington - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	83.4	169.0	776.1	0.0	0.0	1,028.5
20-22.99	124.8	0.0	0.0	81.4	0.0	0.0	206.2
23-25.99	0.0	97.6	0.0	0.0	0.0	0.0	97.6
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**124.8**	**181.0**	**169.0**	**857.5**	**0.0**	**0.0**	**1,332.3**
Washington - Total							
<15	0.0	0.0	8.1	0.0	0.0	0.0	8.1
15-19.99	0.0	83.4	169.0	825.4	0.0	0.0	1,077.8
20-22.99	124.8	0.0	0.0	81.4	0.0	0.0	206.2
23-25.99	0.0	97.6	0.0	0.0	0.0	0.0	97.6
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**124.8**	**181.0**	**177.1**	**906.8**	**0.0**	**0.0**	**1,389.7**

See notes at end of table.

Table A1. Estimates of the Demonstrated Reserve Base of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
West Virginia - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	22.2	22.2
23-25.99	0.0	425.0	380.1	261.3	9.5	71.0	1,146.9
26+	174.1	1,785.5	490.2	440.0	287.1	82.9	3,259.7
Total	**174.1**	**2,210.5**	**870.3**	**701.2**	**296.6**	**176.0**	**4,428.8**
West Virginia - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	186.1	209.3	70.2	465.7
23-25.99	0.0	771.7	803.4	2,037.1	963.0	3,483.3	8,058.4
26+	988.7	8,492.8	3,190.0	4,407.9	3,160.1	2,204.6	22,444.2
Total	**988.7**	**9,264.5**	**3,993.5**	**6,631.1**	**4,332.4**	**5,758.1**	**30,968.3**
West Virginia - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	186.1	209.3	92.4	487.9
23-25.99	0.0	1,196.7	1,183.6	2,298.3	972.5	3,554.3	9,205.4
26+	1,162.8	10,278.3	3,680.2	4,847.9	3,447.2	2,287.5	25,703.9
Total	**1,162.8**	**11,475.0**	**4,863.8**	**7,332.4**	**4,629.0**	**5,934.1**	**35,397.1**
Wyoming - Surface							
<15	0.0	0.0	0.0	1,127.4	210.0	1,646.3	2,983.7
15-19.99	4,870.9	9,668.9	4,390.9	1,550.3	416.3	927.9	21,825.1
20-22.99	35.9	161.8	215.7	54.8	21.6	0.0	489.8
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**4,906.7**	**9,830.8**	**4,606.6**	**2,732.6**	**647.9**	**2,574.2**	**25,298.7**
Wyoming - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	3,780.9	15,220.9	9,690.6	8,779.5	1,185.9	0.0	38,657.8
20-22.99	490.7	501.6	683.2	364.9	0.0	60.7	2,101.2
23-25.99	82.2	503.7	829.9	341.0	0.0	0.0	1,756.9
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**4,353.8**	**16,226.3**	**11,203.7**	**9,485.4**	**1,185.9**	**60.7**	**42,515.8**
Wyoming - Total							
<15	0.0	0.0	0.0	1,127.4	210.0	1,646.3	2,983.7
15-19.99	8,651.7	24,889.9	14,081.5	10,329.8	1,602.2	927.9	60,483.0
20-22.99	526.6	663.4	898.9	419.7	21.6	60.7	2,591.0
23-25.99	82.2	503.7	829.9	341.0	0.0	0.0	1,756.9
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**9,260.5**	**26,057.0**	**15,810.4**	**12,217.9**	**1,833.8**	**2,634.9**	**67,814.5**
United States - Surface							
<15	2,440.9	4,696.1	12,724.5	16,020.2	7,796.6	3,540.2	47,218.4
15-19.99	25,484.4	15,748.2	11,639.5	5,451.7	648.9	1,402.7	60,375.4
20-22.99	257.6	1,068.5	839.0	1,850.1	2,399.6	19,229.8	25,644.6
23-25.99	687.4	3,158.0	2,090.5	2,663.6	3,177.0	7,860.6	19,637.0
26+	617.0	5,115.7	2,321.0	3,036.4	1,263.1	735.7	13,089.0
Total	**29,487.3**	**29,786.6**	**29,614.5**	**29,021.9**	**15,285.2**	**32,769.0**	**165,964.4**
United States - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	41,056.0	36,760.2	24,787.5	15,505.5	1,873.7	758.9	120,741.8
20-22.99	3,168.1	5,604.4	3,929.5	7,146.4	7,450.0	58,423.6	85,722.0
23-25.99	4,046.9	6,408.6	3,822.0	8,821.1	11,448.8	54,658.5	89,205.9
26+	1,800.4	11,778.6	5,609.1	12,676.5	9,122.5	5,118.5	46,105.5
Total	**50,071.4**	**60,551.8**	**38,148.1**	**44,149.5**	**29,895.0**	**118,959.5**	**341,775.2**
United States - Total							
<15	2,440.9	4,696.1	12,724.5	16,020.2	7,796.6	3,540.2	47,218.4
15-19.99	66,540.4	52,508.4	36,427.0	20,957.2	2,522.6	2,161.6	181,117.1
20-22.99	3,425.7	6,672.9	4,768.5	8,996.5	9,849.6	77,653.4	111,366.7
23-25.99	4,734.4	9,566.6	5,912.5	11,484.6	14,625.8	62,519.1	108,842.9
26+	2,417.4	16,894.3	7,930.1	15,712.8	10,385.7	5,854.3	59,194.5
Total	**79,558.7**	**90,338.4**	**67,762.5**	**73,171.4**	**45,180.2**	**151,728.5**	**507,739.7**

Note: Totals may not equal sum of components because of independent rounding. Heat and sulfur content categories of coal resources and reserves are rounded to one decimal place. Conversion of heat and sulfur contents to millions of Btu per short ton and pounds of sulfur per million Btu, respectively, produces values with multiple decimal places. These are rounded to one place within category allocations, as an appropriate expression of accuracy for estimates extended to in-place coal resources and reserves.

Source: EIA Coal Reserves Data Base program, State geological and mineral resource surveys, and other geological reports.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Alabama - Surface							
<15	0.0	0.0	0.0	771.4	0.0	0.0	771.4
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	115.2	169.6	429.1	135.8	0.0	849.7
26+	0.0	137.9	97.5	463.0	0.0	0.0	698.4
Total	**0.0**	**253.0**	**267.1**	**1,663.5**	**135.8**	**0.0**	**2,319.5**
Alabama - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	69.8	99.7	137.5	54.3	0.0	361.3
26+	0.0	79.8	0.0	209.1	0.0	0.0	289.0
Total	**0.0**	**149.6**	**99.7**	**346.7**	**54.3**	**0.0**	**650.3**
Alabama - Total							
<15	0.0	0.0	0.0	771.4	0.0	0.0	771.4
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	184.9	269.3	566.7	190.1	0.0	1,211.0
26+	0.0	217.7	97.5	672.1	0.0	0.0	987.4
Total	**0.0**	**402.7**	**366.8**	**2,010.2**	**190.1**	**0.0**	**2,969.8**
Alaska, South - Surface							
<15	11.1	0.0	0.0	0.0	0.0	0.0	11.1
15-19.99	372.3	40.9	0.0	0.0	0.0	0.0	413.1
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**383.4**	**40.9**	**0.0**	**0.0**	**0.0**	**0.0**	**424.2**
Alaska, South - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	2,067.1	44.1	0.0	0.0	0.0	0.0	2,111.3
20-22.99	0.0	8.9	0.0	0.0	0.0	0.0	8.9
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**2,067.1**	**53.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2,120.2**
Alaska, South - Total							
<15	11.1	0.0	0.0	0.0	0.0	0.0	11.1
15-19.99	2,439.4	85.0	0.0	0.0	0.0	0.0	2,524.4
20-22.99	0.0	8.9	0.0	0.0	0.0	0.0	8.9
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**2,450.5**	**93.9**	**0.0**	**0.0**	**0.0**	**0.0**	**2,544.4**
Alaska, North - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Alaska, North - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Alaska, North - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Arizona - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	46.9	0.0	0.0	0.0	0.0	46.9
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**46.9**	**0.0**	**0.0**	**0.0**	**0.0**	**46.9**
Arizona - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	51.4	0.0	0.0	0.0	0.0	51.4
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**51.4**	**0.0**	**0.0**	**0.0**	**0.0**	**51.4**
Arizona - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	98.4	0.0	0.0	0.0	0.0	98.4
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**98.4**	**0.0**	**0.0**	**0.0**	**0.0**	**98.4**
Arkansas - Surface							
<15	0.0	0.0	0.0	17.7	0.0	0.0	17.7
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.4	0.4
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	1.5	72.9	6.5	1.1	1.1	83.1
Total	**0.0**	**1.5**	**72.9**	**24.2**	**1.1**	**1.4**	**101.1**
Arkansas - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.9	0.9
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	6.6	89.8	20.3	4.7	4.7	126.1
Total	**0.0**	**6.6**	**89.8**	**20.3**	**4.7**	**5.6**	**127.0**
Arkansas - Total							
<15	0.0	0.0	0.0	17.7	0.0	0.0	17.7
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	1.2	1.2
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	8.1	162.7	26.8	5.8	5.8	209.2
Total	**0.0**	**8.1**	**162.7**	**44.4**	**5.8**	**7.0**	**228.1**
Colorado - Surface							
<15	0.0	0.0	3,296.4	0.0	0.0	0.0	3,296.4
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	113.4	0.0	8.2	9.8	0.0	0.0	131.3
23-25.99	150.7	112.9	19.8	30.8	13.8	0.0	328.1
26+	0.0	2.9	0.0	0.0	0.0	0.0	2.9
Total	**264.1**	**115.7**	**3,324.5**	**40.6**	**13.8**	**0.0**	**3,758.7**
Colorado - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	1,399.2	576.8	33.8	0.0	0.0	0.0	2,009.8
20-22.99	744.5	821.0	125.6	79.6	0.0	0.0	1,770.7
23-25.99	1,133.1	637.1	163.3	160.7	81.4	0.0	2,175.5
26+	105.5	147.7	34.2	42.8	0.0	0.0	330.2
Total	**3,382.3**	**2,182.6**	**356.8**	**283.2**	**81.4**	**0.0**	**6,286.2**
Colorado - Total							
<15	0.0	0.0	3,296.4	0.0	0.0	0.0	3,296.4
15-19.99	1,399.2	576.8	33.8	0.0	0.0	0.0	2,009.8
20-22.99	857.9	821.0	133.8	89.4	0.0	0.0	1,902.0
23-25.99	1,283.8	750.0	183.1	191.6	95.2	0.0	2,503.6
26+	105.5	150.6	34.2	42.8	0.0	0.0	333.1
Total	**3,646.3**	**2,298.3**	**3,681.3**	**323.8**	**95.2**	**0.0**	**10,044.9**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Georgia - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.1	0.0	0.0	0.2
26+	0.2	0.4	0.3	0.0	0.1	0.1	1.0
Total	**0.2**	**0.4**	**0.3**	**0.1**	**0.1**	**0.1**	**1.2**
Georgia - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.1	0.0	0.1	0.0	0.0	0.1
26+	0.3	0.1	0.1	0.0	0.1	0.1	0.8
Total	**0.3**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.8**
Georgia - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.1	0.0	0.2	0.0	0.0	0.3
26+	0.6	0.5	0.4	0.0	0.2	0.2	1.8
Total	**0.6**	**0.6**	**0.4**	**0.2**	**0.2**	**0.2**	**2.0**
Idaho - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Idaho - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.1	0.9	0.5	0.5	0.0	0.0	2.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.1**	**0.9**	**0.5**	**0.5**	**0.0**	**0.0**	**2.0**
Idaho - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.1	0.9	0.5	0.5	0.0	0.0	2.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.1**	**0.9**	**0.5**	**0.5**	**0.0**	**0.0**	**2.0**
Illinois - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	5.2	71.2	76.4
20-22.99	0.0	0.0	2.5	197.8	303.0	8,581.8	9,085.1
23-25.99	0.0	0.0	0.7	5.0	30.8	908.4	944.9
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**3.2**	**202.8**	**339.0**	**9,561.3**	**10,106.4**
Illinois - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	45.6	179.3	325.4	802.7	696.5	15,172.8	17,222.2
23-25.99	0.5	8.3	78.8	534.4	552.0	9,701.3	10,875.2
26+	0.0	0.0	0.0	0.0	0.0	1.9	1.9
Total	**46.1**	**187.5**	**404.1**	**1,337.1**	**1,248.5**	**24,875.9**	**28,099.3**
Illinois - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	5.2	71.2	76.4
20-22.99	45.6	179.3	327.8	1,000.5	999.6	23,754.6	26,307.3
23-25.99	0.5	8.3	79.5	539.4	582.8	10,609.7	11,820.0
26+	0.0	0.0	0.0	0.0	0.0	1.9	1.9
Total	**46.1**	**187.5**	**407.3**	**1,539.9**	**1,587.5**	**34,437.3**	**38,205.6**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Indiana - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	39.5	20.3	84.5	0.0	153.5	297.8
23-25.99	0.0	20.5	5.4	16.9	141.0	136.3	320.1
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**60.0**	**25.7**	**101.4**	**141.0**	**289.8**	**617.9**
Indiana - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	139.0	109.0	308.4	527.1	974.6	2,058.1
23-25.99	0.0	108.8	48.3	257.4	447.4	749.5	1,611.3
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**247.8**	**157.3**	**565.8**	**974.5**	**1,724.1**	**3,669.4**
Indiana - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	178.5	129.3	392.9	527.1	1,128.1	2,355.8
23-25.99	0.0	129.2	53.7	274.4	588.4	885.8	1,931.4
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**307.7**	**183.0**	**667.2**	**1,115.5**	**2,013.9**	**4,287.3**
Iowa - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	319.9	0.0	319.9
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**319.9**	**0.0**	**319.9**
Iowa - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	87.3	720.0	807.2
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**87.3**	**720.0**	**807.2**
Iowa - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	407.2	720.0	1,127.1
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**407.2**	**720.0**	**1,127.1**
Kansas - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	53.1	302.9	356.1
23-25.99	0.0	0.0	0.0	0.0	172.4	106.2	278.6
26+	0.0	0.0	0.0	0.0	0.0	47.9	47.9
Total	**0.0**	**0.0**	**0.0**	**0.0**	**225.5**	**457.1**	**682.5**
Kansas - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Kansas - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	53.1	302.9	356.1
23-25.99	0.0	0.0	0.0	0.0	172.4	106.2	278.6
26+	0.0	0.0	0.0	0.0	0.0	47.9	47.9
Total	**0.0**	**0.0**	**0.0**	**0.0**	**225.5**	**457.1**	**682.5**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Kentucky, Eastern - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	11.0	27.6	88.2	22.1	77.2	226.0
20-22.99	0.0	110.2	66.1	110.2	115.7	115.7	518.1
23-25.99	5.5	308.7	407.9	424.4	209.4	198.4	1,554.3
26+	132.3	1,207.1	628.3	771.6	330.7	126.8	3,196.8
Total	**137.8**	**1,637.0**	**1,129.9**	**1,394.4**	**677.9**	**518.1**	**5,495.1**
Kentucky, Eastern - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	2.5	6.3	20.1	5.0	17.6	51.6
20-22.99	0.0	25.2	15.1	25.2	26.4	26.4	118.3
23-25.99	1.3	70.5	93.1	96.9	47.8	45.3	354.9
26+	30.2	275.6	143.5	176.2	75.5	29.0	730.0
Total	**31.5**	**373.8**	**258.0**	**318.4**	**154.8**	**118.3**	**1,254.8**
Kentucky, Eastern - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	13.5	33.9	108.3	27.1	94.8	277.6
20-22.99	0.0	135.4	81.3	135.4	142.2	142.2	636.4
23-25.99	6.8	379.1	501.0	521.3	257.3	243.7	1,909.2
26+	162.5	1,482.7	771.8	947.8	406.2	155.7	3,926.7
Total	**169.3**	**2,010.8**	**1,387.9**	**1,712.9**	**832.7**	**636.4**	**6,749.9**
Kentucky, Western - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	36.9	435.3	416.9	889.1
23-25.99	0.0	0.0	0.0	87.0	465.5	846.9	1,399.4
26+	0.0	0.0	0.0	0.0	18.4	3.2	21.6
Total	**0.0**	**0.0**	**0.0**	**123.9**	**919.2**	**1,267.0**	**2,310.0**
Kentucky, Western - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	5.9	799.8	1,129.7	1,935.3
23-25.99	0.0	0.0	0.0	25.5	786.1	3,879.5	4,691.1
26+	0.0	0.0	0.0	0.0	200.8	89.6	290.3
Total	**0.0**	**0.0**	**0.0**	**31.3**	**1,786.7**	**5,098.8**	**6,916.7**
Kentucky, Western - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	42.7	1,235.1	1,546.5	2,824.4
23-25.99	0.0	0.0	0.0	112.5	1,251.6	4,726.5	6,090.4
26+	0.0	0.0	0.0	0.0	219.2	92.7	311.9
Total	**0.0**	**0.0**	**0.0**	**155.2**	**2,705.9**	**6,365.7**	**9,226.7**
Louisiana - Surface							
<15	0.0	0.0	0.0	342.9	0.0	0.0	342.9
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**342.9**	**0.0**	**0.0**	**342.9**
Louisiana - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Louisiana - Total							
<15	0.0	0.0	0.0	342.9	0.0	0.0	342.9
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**342.9**	**0.0**	**0.0**	**342.9**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Maryland - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	15.9	0.0	15.9
26+	0.0	2.6	7.8	12.5	15.5	0.0	38.5
Total	**0.0**	**2.6**	**7.8**	**12.5**	**31.4**	**0.0**	**54.4**
Maryland - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	106.3	0.0	106.3
26+	0.0	27.9	48.6	103.1	63.1	0.0	242.7
Total	**0.0**	**27.9**	**48.6**	**103.1**	**169.4**	**0.0**	**349.0**
Maryland - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	122.2	0.0	122.2
26+	0.0	30.5	56.4	115.7	78.6	0.0	281.2
Total	**0.0**	**30.5**	**56.4**	**115.7**	**200.8**	**0.0**	**403.4**
Michigan - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.1	0.0	0.1
20-22.99	0.0	0.0	0.1	0.4	0.1	0.1	0.6
23-25.99	0.0	0.0	0.3	1.3	0.3	0.2	2.2
26+	0.0	0.0	0.0	0.2	0.1	0.0	0.2
Total	**0.0**	**0.0**	**0.5**	**1.9**	**0.5**	**0.3**	**3.1**
Michigan - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.3	0.0	0.3
20-22.99	0.0	0.0	3.0	4.6	3.1	2.9	13.6
23-25.99	0.0	0.0	4.8	14.5	9.8	7.8	36.8
26+	0.0	0.0	0.0	2.2	2.5	0.0	4.7
Total	**0.0**	**0.0**	**7.8**	**21.2**	**15.7**	**10.7**	**55.4**
Michigan - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.4	0.0	0.4
20-22.99	0.0	0.0	3.1	5.0	3.1	3.0	14.2
23-25.99	0.0	0.0	5.1	15.8	10.1	8.0	39.0
26+	0.0	0.0	0.0	2.3	2.6	0.0	4.9
Total	**0.0**	**0.0**	**8.2**	**23.1**	**16.2**	**11.0**	**58.5**
Missouri - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	54.5	1,976.0	2,030.5
23-25.99	0.0	0.0	0.0	0.0	95.7	1,006.5	1,102.2
26+	0.0	0.0	0.0	0.0	0.0	28.0	28.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**150.2**	**3,010.6**	**3,160.7**
Missouri - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	2.9	550.7	553.6
23-25.99	0.0	0.0	0.0	0.0	16.7	111.7	128.4
26+	0.0	0.0	0.0	0.0	0.0	7.2	7.2
Total	**0.0**	**0.0**	**0.0**	**0.0**	**19.6**	**669.6**	**689.2**
Missouri - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	57.4	2,526.7	2,584.1
23-25.99	0.0	0.0	0.0	0.0	112.4	1,118.2	1,230.6
26+	0.0	0.0	0.0	0.0	0.0	35.2	35.2
Total	**0.0**	**0.0**	**0.0**	**0.0**	**169.8**	**3,680.2**	**3,849.9**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Montana - Surface							
<15	1,458.1	2,916.2	4,579.2	1,211.9	1,458.1	729.1	12,352.6
15-19.99	16,507.8	4,066.4	4,905.1	1,228.3	151.0	175.9	27,034.4
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**17,965.9**	**6,982.6**	**9,484.3**	**2,440.2**	**1,609.1**	**905.0**	**39,387.0**
Montana - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	15,386.1	9,619.2	7,241.4	2,264.3	342.7	367.7	35,221.3
20-22.99	177.0	214.1	35.7	106.8	69.8	98.0	701.4
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**15,563.1**	**9,833.3**	**7,277.0**	**2,371.2**	**412.5**	**465.7**	**35,922.7**
Montana - Total							
<15	1,458.1	2,916.2	4,579.2	1,211.9	1,458.1	729.1	12,352.6
15-19.99	31,893.8	13,685.6	12,146.4	3,492.6	493.7	543.6	62,255.7
20-22.99	177.0	214.1	35.7	106.8	69.8	98.0	701.4
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**33,528.9**	**16,815.9**	**16,761.3**	**4,811.3**	**2,021.5**	**1,370.7**	**75,309.7**
New Mexico - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	710.7	826.1	1,492.2	0.0	0.0	3,029.0
20-22.99	0.0	326.2	270.2	601.5	0.0	0.0	1,198.0
23-25.99	0.0	7.9	0.0	5.0	0.0	0.0	12.9
26+	35.7	0.0	0.0	0.0	0.0	0.0	35.7
Total	**35.7**	**1,044.9**	**1,096.3**	**2,098.7**	**0.0**	**0.0**	**4,275.6**
New Mexico - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	551.5	232.4	640.4	0.0	0.0	1,424.3
20-22.99	0.0	399.6	271.9	294.4	0.0	0.0	965.9
23-25.99	0.0	286.2	0.2	14.3	0.0	0.0	300.6
26+	24.7	146.8	0.4	0.0	0.0	0.0	171.9
Total	**24.7**	**1,384.0**	**504.9**	**949.2**	**0.0**	**0.0**	**2,862.8**
New Mexico - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	1,262.2	1,058.5	2,132.6	0.0	0.0	4,453.3
20-22.99	0.0	725.8	542.1	895.9	0.0	0.0	2,163.9
23-25.99	0.0	294.1	0.2	19.3	0.0	0.0	313.5
26+	60.4	146.8	0.4	0.0	0.0	0.0	207.6
Total	**60.4**	**2,428.9**	**1,601.2**	**3,047.9**	**0.0**	**0.0**	**7,138.4**
North Carolina - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
North Carolina - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.3	1.3	1.6
26+	0.0	0.0	0.3	1.6	1.3	0.0	3.2
Total	**0.0**	**0.0**	**0.3**	**1.6**	**1.6**	**1.3**	**4.8**
North Carolina - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.3	1.3	1.6
26+	0.0	0.0	0.3	1.6	1.3	0.0	3.2
Total	**0.0**	**0.0**	**0.3**	**1.6**	**1.6**	**1.3**	**4.8**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining	Sulfur Content (Pounds of Sulfur per Million Btu)						
Heat Content (Million Btu per Short Ton)	≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
North Dakota - Surface							
<15	432.3	744.2	1,364.1	3,410.4	850.1	366.1	7,167.2
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**432.3**	**744.2**	**1,364.1**	**3,410.4**	**850.1**	**366.1**	**7,167.2**
North Dakota - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
North Dakota - Total							
<15	432.3	744.2	1,364.1	3,410.4	850.1	366.1	7,167.2
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**432.3**	**744.2**	**1,364.1**	**3,410.4**	**850.1**	**366.1**	**7,167.2**
Ohio - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	12.7	22.6	61.1	179.1	418.1	693.6
23-25.99	20.0	56.0	88.3	282.2	609.5	1,700.5	2,756.4
26+	0.0	27.2	55.9	70.0	69.8	172.9	395.8
Total	**20.0**	**95.8**	**166.8**	**413.4**	**858.4**	**2,291.4**	**3,845.7**
Ohio - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	4.0	4.8	68.2	281.3	649.9	1,008.3
23-25.99	61.4	49.9	127.4	437.3	1,127.3	3,628.2	5,431.4
26+	0.0	18.5	34.9	126.0	358.5	848.5	1,386.5
Total	**61.4**	**72.5**	**167.0**	**631.5**	**1,767.2**	**5,126.7**	**7,826.2**
Ohio - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	16.7	27.4	129.3	460.4	1,068.0	1,701.8
23-25.99	81.3	105.9	215.6	719.5	1,736.8	5,328.7	8,187.8
26+	0.0	45.7	90.8	196.1	428.3	1,021.4	1,782.2
Total	**81.3**	**168.3**	**333.8**	**1,044.9**	**2,625.6**	**7,418.1**	**11,671.9**
Oklahoma - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	18.5	18.5
23-25.99	0.0	20.0	3.4	6.2	9.9	62.0	101.5
26+	0.0	45.2	21.1	27.2	23.1	0.0	116.6
Total	**0.0**	**65.3**	**24.5**	**33.4**	**33.0**	**80.4**	**236.6**
Oklahoma - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	30.2	30.2
23-25.99	0.0	28.5	38.9	35.1	25.9	69.4	197.7
26+	0.0	125.6	59.1	109.3	54.3	0.0	348.4
Total	**0.0**	**154.1**	**98.0**	**144.4**	**80.3**	**99.6**	**576.4**
Oklahoma - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	48.7	48.7
23-25.99	0.0	48.5	42.3	41.3	35.8	131.3	299.3
26+	0.0	170.9	80.2	136.5	77.4	0.0	465.0
Total	**0.0**	**219.4**	**122.5**	**177.8**	**113.2**	**180.0**	**813.0**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining / Heat Content (Million Btu per Short Ton)	Sulfur Content (Pounds of Sulfur per Million Btu) ≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Oregon - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.6	0.3	0.5	0.0	0.2	0.2	1.7
20-22.99	0.3	0.0	0.2	0.0	0.0	0.0	0.5
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.9**	**0.3**	**0.6**	**0.0**	**0.2**	**0.2**	**2.1**
Oregon - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	1.9	0.9	1.4	0.0	0.5	0.5	5.1
20-22.99	0.9	0.0	0.5	0.0	0.0	0.0	1.4
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**2.8**	**0.9**	**1.9**	**0.0**	**0.5**	**0.5**	**6.5**
Oregon - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	2.5	1.2	1.9	0.0	0.6	0.6	6.8
20-22.99	1.2	0.0	0.6	0.0	0.0	0.0	1.9
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**3.7**	**1.2**	**2.5**	**0.0**	**0.6**	**0.6**	**8.7**
Pennsylvania, Anthracite - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	1.8	0.2	0.6	0.0	0.0	2.6
23-25.99	70.0	203.9	48.8	8.8	1.1	0.4	333.1
26+	15.3	56.3	12.3	2.0	0.0	0.0	86.0
Total	**85.3**	**262.1**	**61.4**	**11.4**	**1.2**	**0.4**	**421.7**
Pennsylvania, Anthracite - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	1.3	0.0	0.4	0.0	0.0	1.7
23-25.99	77.9	165.5	22.6	3.1	0.4	0.0	269.4
26+	16.9	38.2	11.9	2.3	0.2	0.0	69.5
Total	**94.9**	**205.0**	**34.5**	**5.7**	**0.6**	**0.0**	**340.7**
Pennsylvania, Anthracite - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	3.2	0.2	1.0	0.0	0.0	4.3
23-25.99	148.0	369.4	71.5	11.8	1.5	0.4	602.5
26+	32.2	94.5	24.2	4.3	0.2	0.0	155.5
Total	**180.2**	**467.0**	**95.9**	**17.1**	**1.8**	**0.4**	**762.4**
Pennsylvania, Bituminous - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	27.0	12.5	39.4
23-25.99	0.0	4.6	19.2	102.7	99.9	87.1	313.4
26+	0.0	17.0	42.6	192.5	92.0	30.7	374.8
Total	**0.0**	**21.5**	**61.9**	**295.2**	**218.8**	**130.2**	**727.6**
Pennsylvania, Bituminous - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	50.9	130.8	120.4	302.1
23-25.99	0.0	50.8	127.9	1,139.5	1,518.0	887.3	3,723.4
26+	0.0	207.2	608.1	3,463.8	2,240.9	361.9	6,881.8
Total	**0.0**	**258.0**	**736.0**	**4,654.2**	**3,889.7**	**1,369.5**	**10,907.3**
Pennsylvania, Bituminous - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	50.9	157.8	132.9	341.5
23-25.99	0.0	55.3	147.1	1,242.2	1,617.9	974.3	4,036.8
26+	0.0	224.2	650.7	3,656.3	2,332.9	392.5	7,256.6
Total	**0.0**	**279.5**	**797.9**	**4,949.4**	**4,108.5**	**1,499.7**	**11,634.9**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining / Heat Content (Million Btu per Short Ton)	Sulfur Content (Pounds of Sulfur per Million Btu) ≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
South Dakota - Surface							
<15	0.0	0.0	103.6	0.8	172.4	0.0	276.8
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**103.6**	**0.8**	**172.4**	**0.0**	**276.8**
South Dakota - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
South Dakota - Total							
<15	0.0	0.0	103.6	0.8	172.4	0.0	276.8
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**103.6**	**0.8**	**172.4**	**0.0**	**276.8**
Tennessee - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	72.6	0.0	0.0	72.6
26+	0.0	38.2	23.1	19.2	39.5	0.0	120.1
Total	**0.0**	**38.2**	**23.1**	**91.8**	**39.5**	**0.0**	**192.6**
Tennessee - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	97.1	0.0	0.0	97.1
26+	0.0	66.5	37.6	32.2	57.9	0.0	194.2
Total	**0.0**	**66.5**	**37.6**	**129.3**	**57.9**	**0.0**	**291.3**
Tennessee - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	169.7	0.0	0.0	169.7
26+	0.0	104.7	60.7	51.4	97.4	0.0	314.2
Total	**0.0**	**104.7**	**60.7**	**221.1**	**97.4**	**0.0**	**483.9**
Texas - Surface							
<15	0.0	0.0	584.3	5,622.6	3,374.5	372.5	9,953.9
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**584.3**	**5,622.6**	**3,374.5**	**372.5**	**9,953.9**
Texas - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Texas - Total							
<15	0.0	0.0	584.3	5,622.6	3,374.5	372.5	9,953.9
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**584.3**	**5,622.6**	**3,374.5**	**372.5**	**9,953.9**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining / Heat Content (Million Btu per Short Ton)	Sulfur Content (Pounds of Sulfur per Million Btu) ≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
Utah - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	27.5	17.3	84.6	34.8	33.7	197.9
23-25.99	7.1	3.9	1.4	0.0	0.0	0.0	12.4
26+	1.0	0.7	0.0	0.0	0.0	0.0	1.7
Total	**8.2**	**32.1**	**18.8**	**84.6**	**34.8**	**33.7**	**212.1**
Utah - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.3	0.3	0.0	0.0	0.0	0.5
20-22.99	0.0	377.7	452.0	765.3	186.1	262.3	2,043.4
23-25.99	297.3	167.9	73.0	0.0	0.0	0.0	538.2
26+	66.1	88.4	0.0	0.0	0.0	0.0	154.5
Total	**363.4**	**634.4**	**525.3**	**765.3**	**186.1**	**262.3**	**2,736.7**
Utah - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.3	0.3	0.0	0.0	0.0	0.5
20-22.99	0.0	405.2	469.3	849.8	221.0	296.0	2,241.4
23-25.99	304.4	171.8	74.4	0.0	0.0	0.0	550.6
26+	67.1	89.2	0.0	0.0	0.0	0.0	156.3
Total	**371.5**	**666.4**	**544.0**	**849.8**	**221.0**	**296.0**	**2,948.8**
Virginia - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	2.1	8.2	68.1	0.0	0.0	0.0	78.4
26+	39.6	182.1	87.5	44.0	0.0	0.0	353.2
Total	**41.7**	**190.3**	**155.7**	**44.0**	**0.0**	**0.0**	**431.6**
Virginia - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	7.5	5.1	7.4	0.0	0.0	0.0	20.1
23-25.99	36.6	75.9	68.3	4.3	0.0	0.0	185.1
26+	98.4	326.5	150.7	77.3	0.0	0.0	652.9
Total	**142.5**	**407.6**	**226.5**	**81.6**	**0.0**	**0.0**	**858.1**
Virginia - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	7.5	5.1	7.4	0.0	0.0	0.0	20.1
23-25.99	38.7	84.1	136.4	4.3	0.0	0.0	263.5
26+	138.0	508.7	238.2	121.3	0.0	0.0	1,006.2
Total	**184.2**	**597.9**	**382.1**	**125.6**	**0.0**	**0.0**	**1,289.7**
Washington - Surface							
<15	0.0	0.0	6.4	0.0	0.0	0.0	6.4
15-19.99	0.0	0.0	0.0	39.1	0.0	0.0	39.1
20-22.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**0.0**	**0.0**	**6.4**	**39.1**	**0.0**	**0.0**	**45.4**
Washington - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	42.2	85.6	392.9	0.0	0.0	520.7
20-22.99	63.2	0.0	0.0	41.2	0.0	0.0	104.4
23-25.99	0.0	49.4	0.0	0.0	0.0	0.0	49.4
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**63.2**	**91.6**	**85.6**	**434.1**	**0.0**	**0.0**	**674.5**
Washington - Total							
<15	0.0	0.0	6.4	0.0	0.0	0.0	6.4
15-19.99	0.0	42.2	85.6	431.9	0.0	0.0	559.7
20-22.99	63.2	0.0	0.0	41.2	0.0	0.0	104.4
23-25.99	0.0	49.4	0.0	0.0	0.0	0.0	49.4
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**63.2**	**91.6**	**91.9**	**473.2**	**0.0**	**0.0**	**719.9**

See notes at end of table.

Table A2. Estimated Recoverable Reserves of Coal by Btu/Sulfur Range, State, and Type of Mining (Continued)

(Million Short Tons Remaining as of January 1, 1997)

State and Type of Mining / Heat Content (Million Btu per Short Ton)	Sulfur Content (Pounds of Sulfur per Million Btu) ≤ 0.40	0.41-0.60	0.61-0.83	0.84-1.67	1.68-2.50	> 2.50	Total
West Virginia - Surface							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	0.0	0.0	14.4	14.4
23-25.99	0.0	271.9	238.4	160.8	6.2	42.4	719.6
26+	111.7	1,142.0	311.8	274.8	171.0	49.1	2,060.2
Total	**111.7**	**1,413.9**	**550.2**	**435.5**	**177.2**	**105.8**	**2,794.2**
West Virginia - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	99.4	111.7	37.5	248.6
23-25.99	0.0	411.8	428.8	1,087.2	514.0	1,859.0	4,300.8
26+	527.7	4,532.6	1,702.5	2,352.5	1,686.5	1,176.6	11,978.5
Total	**527.7**	**4,944.5**	**2,131.3**	**3,539.0**	**2,312.2**	**3,073.1**	**16,527.8**
West Virginia - Total							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20-22.99	0.0	0.0	0.0	99.4	111.7	51.8	262.9
23-25.99	0.0	683.7	667.2	1,248.0	520.1	1,901.4	5,020.4
26+	639.3	5,674.6	2,014.3	2,627.3	1,857.5	1,225.7	14,038.7
Total	**639.3**	**6,358.3**	**2,681.5**	**3,974.6**	**2,489.4**	**3,178.9**	**19,322.0**
Wyoming - Surface							
<15	0.0	0.0	0.0	909.8	170.1	1,393.4	2,473.3
15-19.99	4,274.3	8,433.0	3,843.1	1,320.4	329.9	790.2	18,990.9
20-22.99	28.4	129.6	172.1	43.4	17.1	0.0	390.7
23-25.99	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**4,302.7**	**8,562.6**	**4,015.1**	**2,273.7**	**517.1**	**2,183.6**	**21,854.9**
Wyoming - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	2,041.7	8,219.3	5,232.9	4,740.9	640.4	0.0	20,875.2
20-22.99	265.0	270.9	368.9	197.0	0.0	32.8	1,134.6
23-25.99	44.4	272.0	448.2	184.2	0.0	0.0	948.7
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**2,351.0**	**8,762.2**	**6,050.0**	**5,122.1**	**640.4**	**32.8**	**22,958.5**
Wyoming - Total							
<15	0.0	0.0	0.0	909.8	170.1	1,393.4	2,473.3
15-19.99	6,316.0	16,652.3	9,076.0	6,061.4	970.3	790.2	39,866.1
20-22.99	293.4	400.5	541.0	240.5	17.1	32.8	1,525.3
23-25.99	44.4	272.0	448.2	184.2	0.0	0.0	948.7
26+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**6,653.8**	**17,324.8**	**10,065.1**	**7,395.8**	**1,157.5**	**2,216.4**	**44,813.4**
United States - Surface							
<15	1,901.4	3,660.4	9,934.1	12,287.5	6,025.3	2,861.0	36,669.7
15-19.99	21,155.0	13,262.3	9,602.2	4,168.1	508.4	1,114.6	49,810.6
20-22.99	142.1	694.5	579.9	1,230.7	1,539.7	12,044.4	16,231.3
23-25.99	255.4	1,133.5	1,071.4	1,633.0	2,007.2	5,095.2	11,195.7
26+	335.8	2,861.1	1,361.3	1,883.4	761.3	459.5	7,662.3
Total	**23,789.7**	**21,611.8**	**22,548.9**	**21,202.6**	**10,841.8**	**21,574.8**	**121,569.7**
United States - Underground							
<15	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19.99	20,895.9	19,056.9	12,834.0	8,058.7	988.9	385.8	62,220.1
20-22.99	1,303.7	2,497.5	1,719.2	2,850.0	2,922.8	19,809.0	31,102.1
23-25.99	1,652.5	2,453.3	1,823.5	4,229.3	5,287.6	20,940.2	36,386.5
26+	869.9	6,088.1	2,921.7	6,718.9	4,746.4	2,519.4	23,864.2
Total	**24,722.0**	**30,095.7**	**19,298.4**	**21,856.8**	**13,945.7**	**43,654.4**	**153,572.9**
United States - Total							
<15	1,901.4	3,660.4	9,934.1	12,287.5	6,025.3	2,861.0	36,669.7
15-19.99	42,050.9	32,319.2	22,436.2	12,226.8	1,497.3	1,500.4	112,030.8
20-22.99	1,445.8	3,192.0	2,299.1	4,080.7	4,462.5	31,853.4	47,333.4
23-25.99	1,908.0	3,586.8	2,895.0	5,862.3	7,294.8	26,035.4	47,582.2
26+	1,205.6	8,949.2	4,283.0	8,602.2	5,507.6	2,978.9	31,526.6
Total	**48,511.7**	**51,707.5**	**41,847.3**	**43,059.5**	**24,787.5**	**65,229.2**	**275,142.6**

Note: Totals may not equal sum of components because of independent rounding. Heat and sulfur content categories of coal resources and reserves are rounded to one decimal place. Conversion of heat and sulfur contents to millions of Btu per short ton and pounds of sulfur per million Btu, respectively, produces values with multiple decimal places. These are rounded to one place within category allocations, as an appropriate expression of accuracy for estimates extended to in-place coal resources and reserves.

Source: EIA Coal Reserves Data Base program, State geological and mineral resource surveys, and other geological reports.

In 1990, EIA initiated the Coal Reserves Data Base (CRDB) program, to help meet the growing need for new sources of data for U.S. coal reserves estimates. Years of unpublished mapping data and coal quality data from various sources were being warehoused at State geological surveys in a wide range of formats. In order to promote the processing, analysis, and promulgation of such data, EIA encourages active participation of State surveys in the CRDB program.

The resulting CRDB coal resource estimates include the DRB, along with accessibility adjustments, estimated recoverable reserves (recoverable coal), and allocations by Btu, sulfur, and ash content using coal quality data that are coordinated with mapped resources.

Coal Resource Data Framework

The DRB is part of a larger system of coal resource data and EIA's estimates of coal reserves are part of a hierarchy of U.S. Government coal resource assessment data (Figure 2). The U.S. Geological Survey (USGS) performs mapping and field studies required to calculate identified coal resources, and it may estimate undiscovered resources from extensions of available data, based on known geologic information. State geological surveys also may map coal resources, and many do so in cooperation with the USGS and have adopted USGS criteria as their standards.

EIA's objective is to develop reliable data on coal reserves, but the coal reserves data EIA is authorized to collect from the coal industry are too limited for mid- or long-term analyses. To supply a broader national database of coal reserves, EIA analyzes coal resource data—primarily the DRB, but also the other measured, indicated, and inferred resource categories from which the DRB might be derived. EIA develops the estimated recoverable reserves from the DRB and from data on coal accessibility and recoverability. The USGS and State geological surveys estimate identified resources (which include measured and indicated resources from which the DRB may be derived, as well as resources currently too thin or too deep to include in the DRB) and inferred resources, also not included in the DRB. Finally, the undiscovered resources estimated by the USGS, along with identified resources, constitute the comprehensive "total resources" classification (Figure 2).

Although all the data represented in Figure 2 are interrelated conceptually, in practice they cannot be maintained uniformly. The recoverable reserves at active mines are updated annually but they represent only a fraction of the reserves controlled by major mining companies. EIA treats recoverable reserves at active mines as though they constitute a portion of its estimated recoverable reserves. In reality, some of the data at mines may incorporate reserves located beyond the coverage of the DRB and EIA's estimated recoverable reserves. The mine data EIA receives are not detailed enough to allow comparative analysis.

Further, the data for reserves at active mines are clearly more timely than the broader resource studies from which estimated recoverable reserves are derived. Similarly, the DRB data are derived from more recent sources in many areas than were available when the USGS compiled identified resources and total resources as of 1974. Thus, in Figure 2, the data for active mines are generally more current than the DRB and its associated recoverable reserve estimates, which are in turn more up to date than much of the total resource data. Under current planning, there is little likelihood that total resources of coal will be updated by the USGS in the near future.

Recent Developments

By definition, the DRB does not represent all the coal in the ground. It represents coal that has been mapped, that meets DRB reliability and minability criteria, and for which the data are publicly available. In some areas, the available source data for the DRB are old, and there may be evidence that some coal being mined is not covered in the DRB. In such cases, the DRB is presently out of date. As new data become available, those coal resources are revised via the CRDB program as new data become available. It is considered evidence that resource data and the DRB are out of date if reserves being mined supersede in quantity, location, or physical parameters the resources that have been demonstrated using available data. In isolated cases of this kind, EIA has selectively included inferred coal resources, not in the DRB, but in the data base used to develop certain coal supply forecasts.

Inferred coal resources are not listed in this report because they are less reliable than the DRB and because the coverage of inferred data is not consistent from one State to another. Recent CRDB studies include updated DRB and inferred resources and they extend allocations and analyses to the inferred if supported by the geologic evidence. Even though inferred data are not published by EIA, they are retained on file to supply information about mining potential in important areas.